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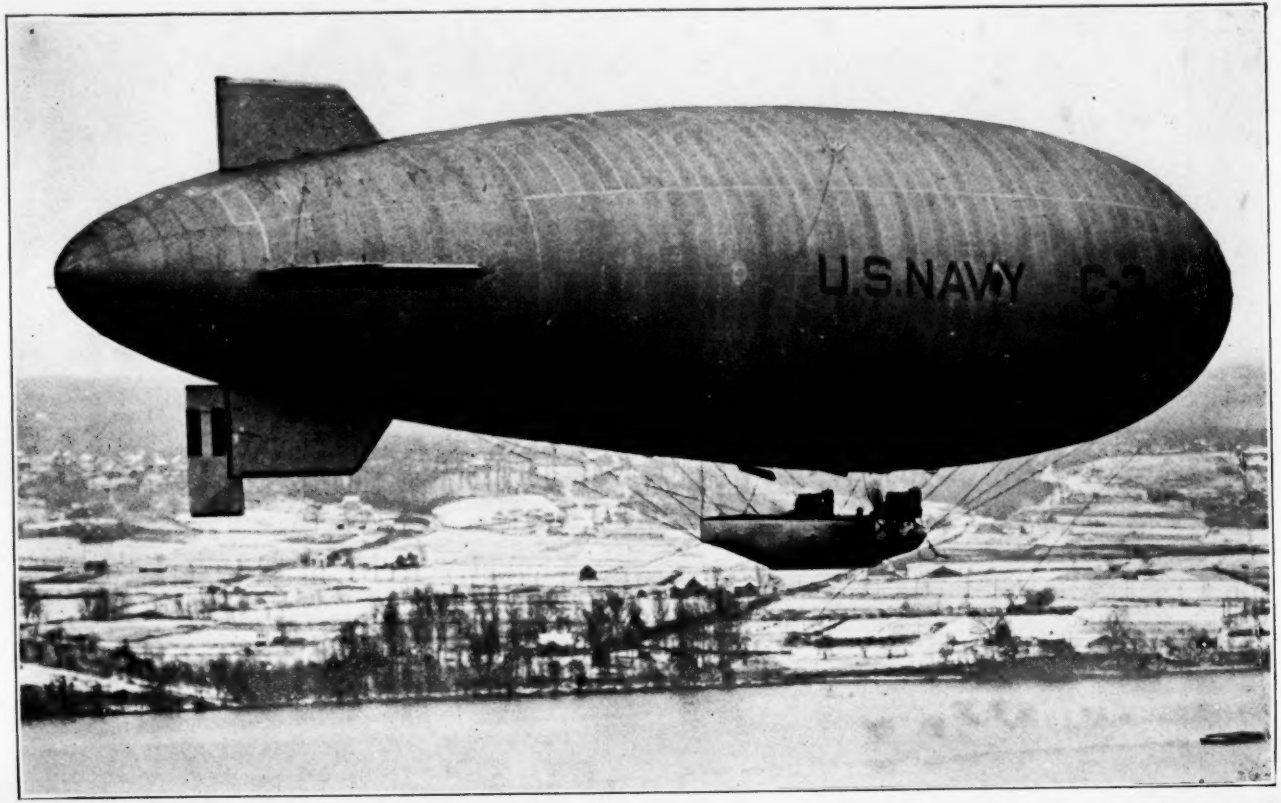

THE C-7 IN FLIGHT OVER THE POTOMAC RIVER ON DECEMBER 5, 1921, DEMONSTRATING THE COMPLETE PRACTICABILITY OF HELIUM AS A LIFTING MEDIUM FOR AIRSHIPS

THE C-7 IN FLIGHT OVER THE POTOMAC RIVER ON DECEMBER 5, 1921, DEMONSTRATING THE COMPLETE PRACTICABILITY OF HELIUM AS A LIFTING MEDIUM FOR AIRSHIPS

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE WHYS AND WHEREFORES OF AIRSHIPS

BY CLIFFORD ALBION TINKER

Formerly of the Bureau of Aeronautics, Navy Department

Airships: How are they navigated, how are they landed, how are they anchored, how many men in their crew, are they safe, and what good are they anyway? These questions are timely, pertinent, and frequently asked; their answers are not difficult, nor do they involve technical jargon incomprehensible to the non-scientific. Aeronautics, like all human activities, is ninety per cent common sense; highly mysterious and obscure theories have little to do with practical aviation.

Navigating an airship, while a common-sense proposition, involving good sound navigational principles, depends, however, on a knowledge of factors not present in surface-ship navigation. The air as a navigating medium has certain characteristics common to the ocean, but in addition, it offers meteorological handicaps which go far beyond any difficulties that ocean traffic has to contend with. The navigator of an airship is the busiest little navigator that one could imagine. He is one nerve-center coöperating with other nerve-centers which go to make up the officers and crew of an airship.

Machinery is never quite fool-proof and the human element must always be reckoned with. Automatic machinery, up to a certain point, can be relied upon; after that, thinking man with trained intelligence completes the cycle. An airship's crew, while not necessarily supermen, must be trained and skilled, and resourceful beyond mere machine operators or balloonists; a mental "dud" has no place on such craft.

To navigate an airship under way, one is concerned with problems involving three dimensions. Like a surface ship, she has to be steered horizontally to cover the shortest course possible from port to port. In addition, however, she must be navigated at varying heights above the land or sea to enable her to take advantage of changing atmospheric conditions or to pass over high mountains, fog, local storms, or other impediments. There is complexity here which calls for skill.

Vertical rudders control an airship in steering on a horizontal course in exactly the same way that one steers a surface vessel; but in height steering, problems are involved which do not interest the surface craft navigator. The airship is enabled to ascend on an even keel by discharging ballast, and to descend by discharging gas. She can be kept on a level course or inclined up or down by her elevator planes, and so may climb or descend by using the thrust of the air on the top or bottom of her hull. When a height is reached, however, where the dynamic lift imparted by the motors and the air thrust just balances the reduction of gas lift due to the gain of altitude, the ship ceases to ascend, the action of her elevator planes becomes neutral, she must discharge ballast to climb farther. Likewise, by use of the elevator planes, she can be forced downwards until the thrust equals the gain of lift when gas must be discharged if lower altitude is the object.

Large rigid airships require two steersmen, one who operates the rudder wheel and holds the ship on the designated compass course, while the other keeps the ship at the proper altitude by operating the elevator planes and by regulating the discharge of gas and ballast.

Surface-craft navigators are supplied with fairly complete data for all their calculations, and ocean navigation is really a matter of well-understood routine. On the charts the speed of the ship

and the directions of the various ocean currents, both of which are constant, are pricked off. Even dead reckoning methods by the patent log come within close enough limits for all practical purposes in the open sea, while the accurate standardization of propellers plus astronomical observations, which are nearly always obtainable, place surface navigation as one of the simple arts. This is not quite so in the case of the airship. Her course and distance made good are the result of her own speed and the speed and direction of the air currents in which she is carried along. Sometimes these air currents are of tremendous velocity.

One can readily see how the airship navigator cannot plot a course by dead reckoning unless he knows the speed and exact direction of the air movement. When an airship is flying over the land, if visibility permits, oftentimes the navigator can determine the air drift by taking observations on fixed points on the surface, and can thus adjust his compass course to enable the ship to maintain the necessary true course. Airship navigators over the North Sea during the World War, when at comparatively low altitudes, figured out their air drift by noting the direction of the waves, a fairly accurate method.

When an airship is caught in a fog or thick haze, a dense storm, or even heavy cloud formations, either over the land or the sea, astronomical observations are impossible, the computation of air drift is out of the question, and in such a case an airship may be driven many miles off her course. Such a contingency, however, is minimized by the use of directional radio apparatus on the airship used in conjunction with ground stations just the same as the radio compass stations along the coast give ships at sea their position and lead them along by continued bearings to port and safety.

Rather a formidable list of navigational instruments is required on an airship. In addition to the magnetic steering compass, there is supplied a prismatic compass which is used in taking bearings of known points on the surface of the earth to determine the ship's position, and a drift indicator, which shows the amount of leeway that the airship is making. Other instruments are: an inclinometer, which shows whether or not the ship is in a horizontal position; an aneroid barometer, for measuring approximate heights of the ship; a statoscope, which indicates the air

pressure, whether it be increasing or decreasing, which tells the navigator whether the ship is falling or rising; and a barograph, which is a recording barometer, the ink line which it traces on a chart being used in calculating the rate of ascent.

The foregoing instruments are all used by the directional and height steersmen, while the navigator himself, in addition to the steersmen's instruments, is supplied with a standard chronometer, giving Greenwich time; and a "trip clock" which is always set at zero at the beginning of the flight, thus furnishing a "time-elapsed" record. The air pressure due to the velocity of the ship, and which has a constant relation to the speed, is measured by a Pitot tube and indicator, while a propeller speed indicator mounted in the air stream is calibrated to give revolutions in terms of air speed. This speed indicator works on practically the same principles as the patent log used by surface mariners.

In the thermometer line the navigator is well supplied. Wet and dry thermometers give the temperature and humidity of the atmosphere, and a thermo-couple gas thermometer operating an indicator gives the temperature of the gas in the gas bags. The readings from these three thermometers applied together serve to calculate the lifting power of the airship under changing atmospheric conditions.

Airships, when not cruising, are either housed in sheds, moored to the ground, anchored over the water, or swinging from mooring masts. The method of landing, mooring, and getting underway, depends upon which one of the above situations confronts the crew.

By all odds, the easiest and most economical means of mooring an airship is the mooring mast. The most expensive and difficult problem of handling an airship is on the ground in connection with hangars and airdromes. Unless the hangar and airdrome are used as a terminal and for repair and up-keep purposes, the expense is enormous; but, inasmuch as terminal hangars are combined with manufacture, overhaul, up-keep and repair, a large force of mechanics and ground men is always available for handling the aircraft, thus reducing the immediate cost of operation. From 300 to 400 men are necessary to handle a large airship on the ground and to "walk" her in and out of a hangar. On the other hand, ten men can handle the biggest airship when making fast or uncoupling from a mooring mast.

The difficulty of handling airships on the ground is due to the possibility of sudden changes of wind, making it a problem to land and enter or leave a shed without damage. The method employed in housing an airship on the ground consists of bringing the ship up to the shed stern first, with the bow to windward of the doors, if a cross wind is blowing. The ship is then "walked" into the hangar by men having hold of her guy ropes, the bow being allowed to drift toward the center line as the stern of the ship is pushed into the building. If the wind is blowing directly in and out of the hangar, it is not necessary to hold the bow to windward, the ship being walked straight in.

The handicap of shifting and variable winds is overcome, to an extent, by the use of wind shields built on either side of the hangar entrance, and, in some instances, the doors are so arranged that they act as wind shields. The mechanical handling of airships in and out of hangars has not been developed to any great extent, although in England and Germany, trolleys running on rails in and out of the sheds have been used, a method which simplifies the operation of housing and reduces the personnel required.

Mooring over the land, aside from the use of mooring masts, is accomplished by wire cables, usually three in number, which are passed through bollards or posts, sunk into the ground at the apices of an equilateral triangle, the cables being then spliced into a mooring swivel at the point of mooring. The mooring swivel is attached to a floating ring on the ground, which moves about to accommodate the pitching and tug of the ship. When airships are moored in this manner, ballasting and gassing, to counteract super-heating and sudden changes in the weather, have to be arranged for on the ground and carried up to the ship by means of a pilot balloon.

When mooring over the sea, an airship drops a sea anchor, or "drogue," formed of a large canvas bucket which fills itself with from two to four tons of water, exerting a drag on the ship's movements and keeping her bow to the wind. The "drogue" is then picked up by surface craft and the airship towed where required or allowed to ride from a mooring rope made fast to the surface ship.

The mooring mast has increased the possibility of commercial use of airships tremendously and reduced the expense of operation

materially. The mast consists of a latticed steel structure from 150 to 225 feet high, perferably not less than one-quarter the length of the airship to be moored, and having at the top a swivel arrangement which allows free movement of the airship as she surges and swings in the wind. An elevator is installed in the mast for the accommodation of passengers, freight, and express matter, the passengers walking across a platform from the swivel structure into the ship, thence down the runway to the cabins. Pipes for the supply of gas, fuel, and water ballast extend up the mast and are coupled to the intake pipes and valves on the ship.

In England, mooring masts have been tested out for long periods, proving to be safe for ships even in winds up to ninety miles an hour, and ships have been moored and unmoored in winds up to fifty miles an hour without difficulty.

Mooring an airship to a mooring mast is simplicity itself. As the airship, en route to the airport, radioes in her time of arrival, preparations at the mast are quickly made. A mooring cable of steel leads from a steam or electric winch at the base of the mast, up the center, through the revolving circular cone and down to the ground again, and is then led out about 600 feet from the mast in the direction of the approaching ship. Two men stand by the end of the cable to make it fast to the ship's cable, one man stands by the winch, and two at the top of the mast to manipulate the anchoring gear.

The ship approaches at an altitude of about 500 feet and reels out her mooring cable in a loop, and when over the end of the cable on the ground, lets go the outboard end of the mooring cable. The two cables are joined and the ship, on signal from the men standing by, rises to an altitude of about 1,200 feet, discharging ballast until she is about two tons light and trimmed down by the stern. The cable is then reeled in at a signal from the ship to haul down.

When she is within about 500 feet of the top of the mast, two other cables about 600 feet long, leading from her mooring stands, are let down. These cables are secured to surging cables, led from the ground into the forward hatch of the ship, and a steady tension is kept on all cables until a cone on the ship's bow slips into an inverted cone on the mast. A cable from a

small winch is then hitched on the mooring cable and the gear pulled down until taken up on the mooring collars at the head of the mast. This securely moors the ship. The surging and holding-down cables are then disconnected and hauled into the ship.

To release the ship, a pendant is let down through the revolving cylinder and tension put on it by means of a hand reel until the locking springs on the cones are free of pressure and can be pulled out. All the engines are started and the after-motor is thrown in gear and speeded up to offset the air speed. With engines backing at the moment when all is ready for letting go, the cone springs are pulled out and the ship rises.

An airship moored to a mast has to be kept trimmed down by the stern at all times when landing, riding at the mast, or getting away. Otherwise, the wind, hitting the nose of the ship, throws the stern up and the ship surges about very badly.

The duties of the crew of an airship in maintaining the ship in commission, in overhauling and repairing the ship and its motors, and "preparing ship for flight" involve duties which might be called "stunts"—they are so entirely different from the procedure on any other kind of craft in existence. Even Jupiter, Neptune, and the gods of the four winds would pop their eyes out at the turning of levers, the sounding of gongs, the shinning along trusses, and wandering around among gas bags, fuel tanks, ballast tanks, and cabins which the crew are obliged to do every day while the airship is inflated.

The first thing in the daily routine is taking the "lift and trim." This is nothing less than calculating the total lift of the airship by summing up the amount of ballast; meaning water, gasoline, oil and other necessaries on board the ship, and noting the result on a special chart. By doing this a daily lift record of the ship is kept, and from this record may be noted how much the lift varies from day to day, for if one day's lift is less than that of the foregoing, and no gas has been valved, it is plainly apparent that a loss has occurred, and immediately the gas bags are inspected for leaks.

By recording the location of ballast on board, the "trim," which means the tendency for lightness or heaviness in one end of the ship or the other, can be noted and compensated for if

necessary. It is highly desirable to keep weights distributed evenly along the length of the ship, otherwise undue stresses may spring the hull structure.

Lift and trim being taken, the crew is sent to the cleaning stations throughout the ship. Not only is the ship itself cleaned and thoroughly polished, but the engineers overhaul and condition the engines and cars, the riggers inspect the controls, gas bags, valves, the outer covering, the fin surfaces, and do any necessary upkeep work to maintain the ship in a top-notch condition.

The framework of an airship, being of duralumin, is extremely light, and in climbing around on the girders of the hull structure there is more or less breakage of small braces and wires, making it necessary for almost constant hull inspection and repair work to be going on. Then again the outer cover fabric may get torn and blown loose at the joints, and when this happens repairs must be made immediately. Otherwise, the small holes would develop into big rents and result in the stripping of large sections of the envelope. The gas bags being very thin and light require a deal of attention. Chafage results in leaks and the consequent loss of gas, lowering its purity and reducing its lift.

Leak detectors are used for inspecting the gas bags. These detectors are applied to the outside of the goldbeater skin covering and register any traces of gas going through them. The leak detector being only twelve inches in diameter, and the surface of the balloonets or bags being tremendous, this leak inspection is a tedious process. Balloonets found to be unusually porous, causing rapid gas leaking and loss of purity, are at once replaced. The bags which are taken out are air inflated, inspected, and repaired where possible. When station equipment is inadequate for this work the bags are sent to the factory for repair. Every week each bag is tested for gas purity which serves as a check on the general condition of the gas tightness of each balloonet, and the ship as a whole.

Other routine work which claims the attention of the crew consists of checking the tension of various wires, correcting any discrepancies, tautening the outer cover, cleaning and reseating water ballast discharge valves, and general inspection of all the controls to see if they are functioning properly. These general inspections are carried out weekly, or oftener if an airship is in constant use.

Preparing an airship for flight is a very active operation. A great many things are going on at one and the same time. The first thing to know is how large a crew is going to be carried, how much freight and the number of passengers, the nature of the flight, and its probable duration. With these factors known, calculations are made which give the amount of gas needed for the necessary additional lift, how much ballast must be carried, and how much fuel will be consumed. The officer-in-charge gives the requirements to the chief engineer, who superintends the taking on board of the fuel and the gas and other mechanical supplies.

The gas is admitted to the ship through a central gassing hose which leads off to each balloonet, the gas coming in directly from the storage holders through large mains sunk in the hangar floor or from the mains in a mooring mast. Four or five men are stationed along the keel inside the ship when gassing is going on to check the amount going to each bag and tie them off when the desired percentage of fill is reached. One man stands by the valve in the gas main and turns off and on as ordered, while the gassing coxswain, on duty in the ship, keeps track of how much gas is going into the ship, which bags it goes into, a list of the bags filled and tied off, and other gassing details.

As the gas enters the ship the lift increases, and this is overcome by putting water ballast aboard, superintended by a detail of four to six men. This is accurate work, for it must be remembered that large rigid airships are six hundred or more feet long, and too much water in one end or the other results in an upsetting movement which brings the overbalanced end down on the hangar floor, or in dangerous proximity to the ground if at a mast, and exerts an excessive lift on the other, a condition which may result in damage to the framework.

While the water ballast is being taken in the fuel supply comes aboard directed by the engineer's force, the fuel being distributed in tanks along the ship so that her "trim" may be maintained. Water ballast and fuel must not be taken on board at a faster rate than the incoming gas, so that the buoyancy of the ship may not be materially changed but kept approximately the same at all times.

After the ship is gassed, fueled, and ballasted, very careful lift and trim charts are worked out showing the amount and

location of all fuel and ballast. These charts are posted in the pilot house and are constantly referred to by the operating officer on all flights. Finally, the engineers inspect and turn over all motors, and the ship is ready for flight.

When the crew goes on board a sufficient amount of ballast has to be immediately discharged to compensate for their weight. When passengers and freight come aboard more ballast has to be discharged. It will thus be seen that the airship's crew is kept very busy just prior to a voyage.

If starting from a hanger, an additional thousand pounds of ballast is discharged to increase the buoyancy and thus facilitate the ship's handling and give it positive lift for leaving the ground.

An airship flight is carried out, as far as possble, along the lines of any seagoing operation. All orders are given and all watches stood and relieved just the same as on a surface ship. During flight, in addition to the two helmsmen, there is on duty in the control car, the captain of the ship or the first lieutenant, the senior navigating officer, an assistant navigating officer, and one other watch-standing officer who relieves the captain or first lieutenant when requested; otherwise, he makes frequent tours of inspection along the keel to see that the gas bags are in proper position, the valves functioning, and the riggers on duty at their stations. The watch is relieved every four hours, a procedure carried out on all ships. In the radio cabin, generally in the control car, there is a radio operator always on watch.

Every two hours the gasoline supply is checked, the amount remaining computed, and its location posted on the chart in the control car. The engineer officer inspects the various power units, checking their operation at frequent intervals, and he also keeps an eye on the gasoline supply along the keel. If it is not necessary to utilize all the power units at one time, the engineer officer advises the officer having the deck the units that are to be used and those in reserve or being overhauled.

Another touch which reminds one of surface ships is the way orders are transmitted from the control car to the power units. An engine telegraph is used, designed, of course, for airships. When it is desired to "conn" the ship, orders are given to the steersman in accordance with Navy practice. Orders to the height

steersman are given in a similar manner, although they are varied to suit the circumstances.

The crew of a three-million-cubic-foot airship, for commercial purposes, numbers about twenty men. Military and naval craft, however, carrying bombs, machine guns, and aerial cannon, would employ a larger crew, including ordnance and gunnery officers and men.

Quarters for passengers in the newest airships are gorgeously decorated, luxuriously upholstered, and more comfortable than any train or steamship could possibly be, and this, plus the stability of the airship, furnishes a method of travel unsurpassed by any other known means. In the British passenger airship *R-36*, are accommodations for fifty passengers on a scale rivaling that of the highest class hotels.

In the Paris *Daily News* the *R-36* was described as a flying palace, in which travelers are lulled to sleep in the sky. The ship is 672 feet long, has a lifting power of sixty-three tons, a maximum speed of sixty-five miles an hour, and a cruising range of 4,000 miles.

To quote from the *Daily News:* "Entering the passenger car one is struck by the delicate construction—slender aluminum pillars and semi-transparent walls of 'doped' cotton, stretched tightly over a marvellous framework. The dining-room, with its linen-covered and silver-laden tables, its rugs and soft curtains, is reminiscent of a cosy city café. The sleeping quarters are a marvel of ingenuity. There are two rows of cabins, each accommodating two passengers on light hammock-slung beds, the finest sleeping-car accommodation available. During the day the beds are folded up, and the apartment is transformed into a magnificent drawing-room with delicate light-blue curtains and deep, comfortable lounge chairs."

Are airships safe? Indeed they are. Millions of miles have been flown in airships, and hundreds of thousands of passengers carried without the loss of a life. Vulnerability in war must not be confused with peace-time operation of airships. A comparatively large number of German rigid airships were lost by gunfire during the war. In fact, they might be considered to be particularly vulnerable in battle, but so were concrete and steel forts, battleships, and battle cruisers.

Fire is popularly regarded as the chief danger to airship operation, but while the fire hazard exists, very few ships, except in battle, have been so destroyed in operation. Of course, open fires are prohibited, and smoking is not allowed, the cooking and heating being done by electricity. This is because the lifting gas, hydrogen, is by itself inflammable and gasoline fumes, also inflammable, are sometimes present inside the envelope.

American rigid airships, however, will not be exposed to these dangers. The buoyant medium will be helium, of which this country contains practically all of the world's supply. An engine is now being tested in one of the great manufacturing plants of this country which will do away with gasoline as a fuel, and with the fire hazard removed there can be no safer method of travel than by airship.

In answer to the question—"What good are airships?"—one need only say that they furnish the quickest, cleanest, most comfortable long-distance method of transportation known to man. No dust or cinders, no jerking and rattling, no seasickness or slatting about on a stormy sea. Comfort, cleanliness, and luxury, at a medium cost, make air transport an enjoyable and inexpensive experience.

There has been formed in the United States a great air transport corporation which will establish, within a year, several airship lines across the country, employing ships of enormous size, of great speed, and large carrying capacity. This will provide a supplementary means of transport in addition to our transcontinental railroads which will place the United States in the foremost position in aeronautical development in the world.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

DER TAG

By Captain J. F. Hellweg, U. S. Navy

For many years all good Germans have been toasting "Der Tag" on every possible occasion. By good Germans is meant all those inhabitants of Germany and particularly Prussia whose sense of right and wrong is so perverted that they could, and did, commit the most terrible acts of "frightfulness"; could witness the most excruciating torture of their helpless victims without the slightest signs of remorse.

Bismarck, the idol of the Germans and a strong advocate of "frightfulness," is credited with the following order issued to the Prussian soldiers governing their actions in 1870 against the French: ". . . above all you must inflict *on the inhabitants of invaded towns* the maximum of suffering, so that they may become sick of the struggle and may bring pressure to bear on their government to discontinue it; *you must leave the people through whom you march only their eyes to weep with.*" And the German forces have obeyed this fiendish order literally during the recent war, as the French and Belgian citizens have learned to their sorrow.

The arrogance of the Germans was so great that they even toasted "Der Tag" in the presence of the citizens, and sometimes the officials of those countries whom they meant to crush and ruin when "Der Tag" dawned.

On the twenty-first day of November, 1918, the German high sea fleet appeared out of the mist at 9:43 A. M., in latitude fifty-six degrees, eleven minutes, north; and longitude one degree, twenty minutes, west, with guns laid fore-and-aft, and there met

the grand fleet under the command of Admiral Sir David Beatty, R. N., and proceeded into a British port escorted by the British, French, and American ships on both sides and all "cleared for action," for they were on their guard.

The German high seas fleet on that memorable day in November, 1918, consisted of the following ships, steaming in single column as indicated:

BATTLE CRUISERS

Seydlitz—Flying the flag of Commodore Tägert.
Moltke
Derfflinger
Hindenburg
Von Der Tan

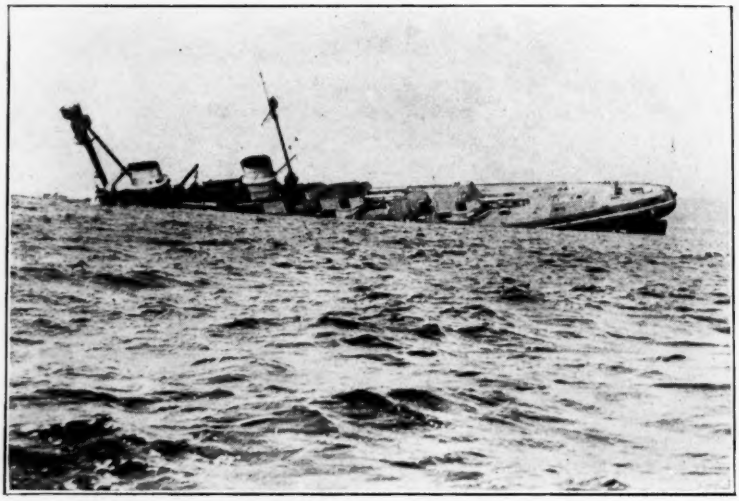
BATTLESHIPS

Friedrich Der Grosse—Flying the flag of Rear Admiral Von Reuter, the commander-in-chief of the German high seas fleet.
König-Albert
Kaiser
Kaiserin
Prinzregent Luitpold
Bayern
Kronprinz Wilhelm
Mark Graf
Grosser Kurfürst

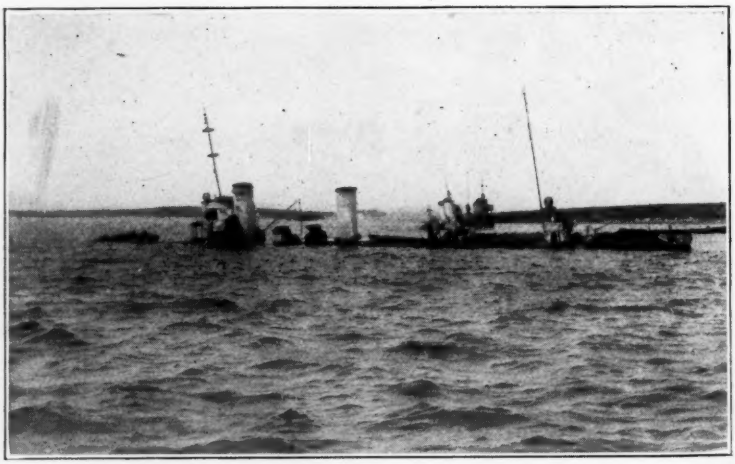
CRUISERS

Karlsruhe—Flying the flag of Commodore Harder.
Frankfurt
Emden
Nurnberg
Brummer
Koln
Bremse

None but the Germans themselves can fully appreciate how different was that twenty-first day of November, 1918, from "Der Tag" about which all good Germans had been dreaming and which they had been toasting for years. The rest of mankind can thank God that the German's "Der Tag" never dawned.



BATTLE CRUISER, "DERFFLINGER" TAKING HER FINAL PLUNGE AT 2:45 P. M., JUNE 21, 1919. SHE WAS ONE OF THEIR BEST SHIPS.
Note the lack of heavy top-hammer such as the H. M. S. *Hood* and the U. S. S. *Tennessee* have.



GERMAN DESTROYERS SINKING AFTER BEING SCUTTLED BY THEIR OWN CREWS AT SCAPA FLOW

On the twenty-first day of June, 1919, seven months later to the day, the Germans ran true to form and scuttled their ships at Scapa Flow.

The work of raising the smaller ships was under way as soon as practicable, and nine months later—March, 1920—I was detached from duty in France and proceeded to Rosyth, Scotland, for duty in connection with the refitting of the ex-German ships allocated to the United States for their trip home.

A more dismal sight than the ex-German destroyers can hardly be pictured. Moored by pairs to buoys in the Firth of Forth, rusted and stripped, sides stove in, masts carried away, rails bent and twisted, bridges sagging, bridge screens tattered and flapping in the sharp wind, decks littered with wreckage, and guns pointed skyward, they looked like battle-stained, disheveled, beaten German troopers with both hands in the air, yelling "Kamerad."

Even the boats themselves listed toward each other as if they were too exhausted and too crippled to stand on an even keel. They truly presented a sombre picture, their silhouettes hazily outlined against the gray lowering sky of a stormy Scotch March afternoon.

On going on board the ships allocated to the United States, it was quickly seen that the task of preparing them for their long trip to the United States would be a big one, one that would tax the ability and the perseverance of all hands. As the ships had been submerged for a long period, they had naturally collected a considerable amount of silt in practically all compartments. Most of the compartments were still partially flooded, and all were filled with every conceivable kind of wreckage.

Most of the gear that had not been wrecked had been carried off, so that it was with a rather depressed feeling that I completed my first inspection and returned on board the ship of the senior American naval officer present. A couple hours in the cheerful company of Captain Kimberly, who displayed an unsuspected amount of dry humor during an excellent and much appreciated dinner, made everything look much brighter.

At that time, 12 March, 1920, the following American ships were in the Firth of Forth: U. S. S. *Chattanooga,* Captain V. A. Kimberly; U. S. S. *Panther,* Commander C. E. Wood; U. S. S.

Hovey, Commander S. B. McKinney; U. S. S. *Chandler,* Lieutenant-Commander F. Cogswell.

A few days later the U. S. S. *Ballard,* Lieutenant-Commander H. T. Settle, arrived; and a couple weeks later the three mine sweepers: U. S. S. *Red Wing,* Lieutenant F. C. A. Plagemann; U. S. S. *Rail,* Lieutenant A. E. Freed; U. S. S. *Falcon,* Lieutenant W. B. Buchanan, arrived from the United States for duty in connection with the towing of the three ex-German destroyers home.

Working parties from all these ships were immediately put on board the three destroyers *G-102, S-132,* and *V-43,* and the cruiser *Frankfurt* to dig out the dirt preparatory to starting repairs. The inspection of the *Frankfurt,* a 5,500-ton cruiser, showed her to be in much the same condition as the destroyers; compartments flooded, nearly everything either wrecked or gone, and the entire ship littered with an indescribable mass of wreckage.

All four of these ships had to be docked, cleaned and painted. Their propellers had to be removed to facilitate towing home, as it had been decided that the time and expense to put them in condition to steam home was not warranted. All the numerous holes in their sides and under-water bodies had to be plugged or blanked as a safety precaution for the long trip across the open sea.

In addition, quarters had to be made habitable, cleaned, disinfected, and painted, galley arrangements had to be provided, and all water tanks and their pipes had to be scrubbed, disinfected, and gone over very carefully as a precautionary measure.

As two of the destroyers had very low freeboard, and as many deck fittings such as ventilator cowls, etc., were missing, all deck openings had to be blanked off to insure against later trouble in case we should encounter heavy weather. In this task the U. S. S. *Panther* did excellent work, assisted by the crews of the destroyers.

The British naval officers were very courteous throughout our stay at Rosyth and at Port Edgar, particularly the admiral superintendent of the Rosyth dockyard, Rear-Admiral Sir John F. E. Green, R. N., who commanded the battle cruiser H. M. S. *New Zealand* at Jutland, and Captain Berwick Curtis, R. N., in command of the destroyer base at Port Edgar. During the war,

Captain Curtis had commanded in the Harwich Patrol, a most hazardous billet, and later had commanded a mining division and the H. M. S. *Abdiel* at Jutland, where his daring work was recognized and won for him a decoration by the King.

Thanks to the particularly generous coöperation of Captain Curtis, we were able to place our American destroyers in the destroyer docks at Port Edgar and to tie up an ex-German destroyer alongside each of ours, increasing the speed of our work enormously as long as the American destroyers remained with us.

In the meantime the U. S. S. *Panther,* our repair ship, was devoting her attention to the pumping out and cleaning of the cruiser *Frankfurt,* preparatory to the actual repair work.

I left France on 8 March, 1920, in a rush, as the ex-German dreadnaught was expected to sail from Germany immediately. Internal trouble prevented her sailing, until just when I was wondering whether she would ever sail, word came that she was due on the fifth of April.

Everything was made ready, but again it proved a false alarm. Late on the sixth of April, the British Admiralty notified us that a tug would be placed at our disposal the following morning to take us to meet the German convoy which was due to arrive.

All our arrangements had been very carefully prepared and completed for a long time, and it only needed the signal for all hands to be in their places.

Our Navy will long remember the damage done to the ex-German ships by German sympathizers in the early days of the war while the ships were lying in our ports interned. The later surreptitious attempts which were made will also be long remembered. Armed with this previous experience, we made careful plans to block any such efforts, or to minimize the results of such efforts. It need only be added that the Germans ran true to form, and that the only reason their efforts were not completely successful is because we had prepared to counteract them.

Our boarding party consisted of thirteen officers and fifty-four bluejackets borrowed from the various American ships in port. The party was provided with miner's lamps, electric torches, gas masks—the latter in case we had to send a rescue party into any compartment—tools, etc. A medical officer and a hospital party

accompanied us; and, in addition, there was an armed guard under the command of a particularly level-headed officer, for no one could foretell what disturbance might occur.

Shortly before two o'clock we made out smoke on the horizon, and soon the convoy hove in sight, led by the British battle cruiser H. M. S. *Tiger* and escorted on both sides by British destroyers.

The ex-German battleship *Nassau* was towing the *Ostfriesland*, and cast off as soon as our tugs rounded to close aboard. By three-thirty P. M., our party was on board and the British tugs took the *Ostfriesland* in tow and stood in toward our anchorage off Burntisland in the Firth of Forth.

The German crew, of which there were quite a number, were massed on deck in the vicinity of the gang-plank we threw aboard; a curious, ill-dressed, unshaven, and dirty looking lot, staring at us as we jumped on board. There was not an officer in sight, a German discourtesy that did not surprise me in the least. Just prior to our boarding, the men were again cautioned to have nothing to do with the crew, to confine their conversation strictly to the requirements, and to watch everything carefully. Accompanied by the British pilot and a helmsman, I made my way to the bridge where two officers were found. Their presence was acknowledged and then as completely ignored as they had ignored our coming on board ship.

On the way in to port, the ten inspection parties of blue-jackets, each under the immediate supervision of an officer, inspected their parts of the ship according to our plans in order to insure that everything was safe and seaworthy. As the *Ostfriesland* did not steam to Scotland from Germany but was towed, the size of her crew surprised me and immediately aroused my suspicions. With such a crew, they could methodically carry out all possible schemes after leaving port, and without the slightest risk.

The following extracts from my official report to the Department indicate the thoroughness with which they gutted the ship:

All copper and brass fittings, pipes, etc., were missing, leads hacked and cut, gauges were smashed, valves gone, and efforts made to injure motors. The electric leads to the cranes, auxiliary machinery, and winches had been chopped and torn apart. Other electric fittings had been torn loose and taken. The condition of the main engines was fair.

In the officers' quarters everything had been stripped. Some quarters were found in an indescribably filthy condition, apparently not the result of inadvertance, but of deliberate intention. For example: All officers' rooms were fitted with standard closing washstands like those fitted in the passengers' staterooms on the liners. In a number of cases these basins were filled with human faeces. Some were closed, others were open. The height of these basins above the deck necessitated their standing on chairs or boxes to use the basins in this manner. Between the time of our arrival on board the *Ostfriesland* about 3:30 P. M., and the time of the departure of the German crew, someone entered the admiral's quarters and capsized the remains of a tub of apple butter or similar looking substance on deck, and then splashed it about. In addition, they scrawled their usual parting salutation, "Deutschland Über Alles," on the bulkheads.

Some valves in out-of-the-way corners of small compartments were removed, leaving the pipes wide open. Before these were discovered and blank-flanged, we had several cases of flooding in various parts of the ship. The same filthy condition found in some of the officers' quarters was found in a number of other parts of the ship, resulting in a considerable amount of very distasteful work for the crew of the U. S. S. *Panther*. In defiling the compartments, they apparently selected those which were the most difficult to clean.

The radio room was completely stripped, nothing remaining except wires which were cut. Throughout the ship, fuses were generally missing, in many instances the boxes themselves being torn from their fittings and missing. The fire control terminals in gun rooms were destroyed, fire control buzzers and gongs missing, and visual indicators smashed or gone. All the securing lugs for the turrets were missing except two, which were evidently overlooked. The fire control and conning towers forward and aft were completely wrecked, gutted, wires slashed, and marks and indicators missing. The bridge was stripped of all navigational instruments.

All searchlights and their fittings were gone. Turret sights were missing. The port bower anchor and about seventy-five fathoms of chain from the anchors on board were also missing. The stern anchor and three kedge anchors had been removed. All

the lower boom gear, all boats except two dirty old thirty-foot cutters, even the lifeboats and their davits, had been removed. This last necessitated our purchasing lifeboats and their davits from the British dockyard and rigging them on the ship's sides. Signal yards and topmasts were missing, and all the masts' stays except three were missing, necessitating our fitting new mast stays to support the masts properly.

During the run up the Forth, I made a brief inspection of some parts of the ship and discovered numerous indications of elaborate preparations to loot the ship. They had made what appeared to be complete plans for the wholesale destruction of parts of the engineering and electrical equipment before their departure for Germany on their transport *Rugen* which had accompanied them. I shall always believe that their landfall was delayed till afternoon in order to insure their anchoring in port after dark, thereby giving them a legitimate excuse for remaining on board overnight. Whether they intended to transfer all of the gear to the *Rugen* during the night for return to Germany or to drop a large part of it overboard will never be known.

But inasmuch as they had dismounted several large motors and had them crated, it is reasonable to suppose that they intended taking them under cover of darkness to the *Rugen*. The wiring tunnel looked as if it had been used as a demolition chamber to fragment a fourteen-inch shell. Everything was cut to pieces.

They had even commenced to dismount the turret gear in the after turret. For what purpose is not known, but it is supposed that this gear was also to be carried off.

The destruction of plans which were necessary for the control of the flooding and drainage systems was very deliberate and thorough. The signs used to designate the different types of valves and connections were removed with a file or other sharp instrument and the connections in the vicinity of the drainage pumps were slashed in forty or more places so as to make them unintelligible. Sections of piping in various parts of the ship were removed and carried to other parts of the ship. I can not believe that this was deliberately done, it was too stupid, and not in accordance with their usual shrewd practices. Packing was removed from all stuffing boxes—possibly done in laying up the machinery. Most of this was easily found, but the pack-

ing in the expansion joints was the source of considerable trouble, as there were so many expansion joints, approximately sixty.

Acid in carboys in a small after compartment surrounded by bundles of waste paper, oil-soaked waste, and other combustible material could not have been an accident, it was too deliberately arranged. This compartment was immediately cleaned and the material thrown overboard.

It was quite dark when we anchored in the Firth of Forth shortly after eight o'clock near Burntisland. The German crew was immediately ordered off the ship, and was transferred to the *Rugen* by a British tug.

This unexpected order to clear the ship immediately, evidently capsized their plans. They protested, stating that it was impossible to get their dunnage together till morning; and, besides, they said they must stay to give my men instruction below.

They were allowed thirty minutes to clear the ship. Had they been permitted to remain on board all night, their night's lodging probably would have cost the United States government thousands of dollars. They might even have made it impossible to steam the *Ostfriesland* home. As they had the audacity to attempt to light fires in dead boilers while my men were down below en route to port, one can imagine what they would have done had they been on board all night. The chief engineer of the U. S. S. *Panther* and his men deserve great credit for blocking the efforts made to spoil things down below.

For days afterwards we continued to find additional evidence of their elaborate plans for the removal of motors, auxiliaries, blowers, pumps, motor-generators, ventilating motors, fittings, spare parts, etc., and the destruction of what was to be left. Small parts were collected and made in neat bundles securely lashed for easy handling.

One able-bodied German was discovered attempting to carry off a motor weighing approximately one hundred pounds, secreted in a box under his clothing. Two other motors, one smaller and one larger, were found in an easily accessible room on the main deck ready to be carried off. Our armed guard was stationed on deck and searched any man's effects which aroused suspicion.

Five busy weeks quickly passed, and the long expected transport, U. S. S. *Hancock*, Captain J. G. Church, arrived from the

United States with the officers and crew for the ex-German ships. Prior to her arrival, the dirtiest work on the *Ostfriesland* had been cleaned by the U. S. S. *Panther,* whose entire crew deserves great credit for what they accomplished when their small force available is considered.

Almost immediately after the arrival of the *Hancock,* orders were received to redistribute the crews on ships in the Forth, giving the ships to remain on the station, long-timers in exchange for their short-timers, sick, B. C. D. and G. C. M. prisoners. Soon after the redistribution of crews, the other ships which had been needed for some time in the Mediterranean and elsewhere, were detached; and, one by one, we saw them sail away until we were "on our own" with our German wrecks, the *Hancock,* and the *Panther.*

The *Hancock* brought over a complete set of machine tools, individual electric drive. One of the first things accomplished by the chief engineer, Lieutenant-Commander Karl Smith, was the installation of this shop under the forecastle on the port side. The entire compartment was assigned for this purpose, giving them an excellent shop. Even before the machines were completely installed and secured, they were in use; and from that time till the end, they were seldom idle.

After forty-one days of the hardest and dirtiest kind of work, officers and crew frequently working late into the night, the ship was clean enough and was ready to hoist the American flag. On the eighteenth of May, 1920, at 4:28 P. M., the U. S. S. *Ostfriesland* was placed in commission with appropriate ceremonies at the British dockyard at Rosyth, Scotland.

Having completed the repairs to the destroyers, they were placed in commission on the fifth of June, and sailed from Rosyth, Scotland, on the seventh of June on the first leg of their long journey home in tow of the three mine sweepers and convoyed by the U. S. S. *Hancock.* They arrived at Brest, France, four days later, having covered the first eight hundred miles without accident. The three mine sweepers immediately returned to Rosyth.

The remainder of the convoy, consisting of the *Ostfriesland* and the *Frankfurt,* sailed from Rosyth on the seventeenth of June for Brest, the *Frankfurt* in tow of two of the sweepers in

tandem with the third sweeper standing by. The *Frankfurt* had been placed in commission on the same day as the destroyers, and in her new coat of paint looked spic and span, a really handsome ship. The *Ostfriesland* sailed early in the morning and spent the forenoon compensating a compass which we had obtained from the *Hancock*. Our plans worked so well that we were just finishing when the *Frankfurt* passed in tow of the two sweepers.

The first sweeper's tow line was secured to a bridle on the second sweeper. This bridle was led aft on both sides, turns being taken on all bitts, and the ends were well secured. The second sweeper paid out her towing hawser to the *Frankfurt* and when everything was set, they "gagged" the towing engine as it was not believed that the latter could stand the strain of the combined pull of both sweepers. The *Frankfurt* secured the tow line to her port anchor chain and veered about thirty fathoms of it. This rig behaved beautifully until the night before we reached Brest, when it began working in the seaway, and finally, the next morning when in sight of Ushant, the line let go, causing a delay of several hours.

During this run to Brest, we encountered much fog and the run down the English Channel was made as much on soundings as on bearings. We had wonderful luck for the fog lifted each time an important point was reached where the course had to be materially altered. The navigator, Lieutenant-Commander S. B. Robinson, did excellent work carrying the convoy through the English Channel under such adverse weather conditions. He made an excellent landfall on Ushant on the morning of the fourth day.

Shortly after our departure from Rosyth, the naval attaché at London requested me to investigate the possibility of carrying home on some ship in the convoy one or more of the naval guns stored at Rosyth. These guns had formed a reserve for Admiral Rodman's battleships which had operated with the British grand fleet during the war. Two twelve-inch guns had been sent home at great expense on a merchant ship. Almost two years after the armistice had been signed, two more twelve-inch and two fourteen-inch guns still remained at Rosyth.

Immediately upon the receipt of Captain Sexton's letter, I had templates made of the guns and tried them in various places on the

main deck of the *Ostfriesland* as we all realized that there was nothing else in the convoy that could possibly carry even one of the guns, without great delay and considerable risk. After some dovetailing and cutting away of deck fittings around the turrets, we found four places for the four guns symmetrically arranged both fore-and-aft and athwartships.

The next question was whether we could carry such a load—approximately two hundred and sixty tons—so high up without making us tender. Our store rooms were practically empty and the magazines were absolutely empty, while our bunkers were so arranged in upper and lower bunkers that I did not know how she might behave in a seaway. The whole undertaking of preparing these ex-German ships and getting them home was a little out of the ordinary, owing to their condition and the actions of their previous crews. We had no precedents to refer to, in fact we had to make our own as we went along, therefore, one undertaking more or less made little difference.

The young British naval constructor coöperated perfectly with us and carried out the inclining experiment, which I requested him to make, exactly at the time I specified so as not to interfere with the other urgent ship's work. The naval attaché, Captain Sexton, U. S. Navy, had particularly specified that while the work of transporting the guns to the United States was very important and would relieve him of a long delayed "white elephant," at the same time it must not delay the departure of the convoy in the slightest.

The coöperation of the young British naval constructor was therefore particularly appreciated. As soon as the inclining experiment showed that we could safely carry the load, the guns were rushed on board. I shall never cease to admire the teamwork of that rigger's gang at Rosyth. With the assistance of the big floating crane, they brought those guns alongside two at a time and whipped them on board as quickly and as easily as I would carry a suitcase on board. The two twelve-inch guns being shorter, were carried athwartships, one abaft the forecastle turret and under its overhang; and the other, forward of the quarter-deck turret and secured under its overhang. The forward one was secured muzzle to starboard and the after one muzzle to port. Heel lashings secured to large pad eyes temporarily fitted to the

deck prevented any end movement of the guns; while body lashings held the guns down snugly in their cradles. These cradles were made of twelve by twelve timbers tied together with iron straps, forming very wide bearings for the guns. Heavy angle irons bolted to the deck parallel and spaced equal to the width of the cradles formed channels and held them in place. The cradles were not secured to these angle irons, the idea being that if the guns worked in a seaway, their movement would tend to rock the cradles on one or the other of their fore-and-aft edges, and that this rocking motion would result in a tendency to lift the guns slightly thereby jamming their body lashings more tightly. This scheme worked beautifully, and the guns were snug throughout the trip. By placing all the guns close to turrets we took advantage of the extra stiffness of the decks and the heavy bulkheads and therefore had practically no shoring to do between decks. However, when we had been at sea for some time and the chief engineer blamed his trouble with the starboard engine on the concentrated loads on deck, it is possible that he was right.

The two fourteen-inch guns were a little more difficult to get in place, due to their greater length. They had to be worked in under the overhang of the one waist turret and against the other on the opposite side of the ship, without being able to make a straight lift owing to the presence of the fore-and-aft bridge.

The forward one was run from starboard bow to port quarter, muzzle to port, and under the overhang of the port forward turret. The breech was secured against the starboard forward turret.

The after fourteen-inch gun was run in the opposite direction; that is, from the port bow to the starboard quarter with the muzzle to starboard in order to balance weights. The breech was secured against the port after turret, and the muzzle against the starboard after turret.

This arrangement distributed the weights evenly throughout the ship's length and kept them as near the center line as possible. But to go along the deck at night was somewhat like going through a back alley in a Scotch town in the early daylight. I have heard that the Highland Fling originated in the Scotties jumping over the trash and ash piles in the back alleys in the

early morning on their way to work. The cost of transporting such awkward and concentrated weights is very expensive as the commercial carriers must be laid up to have extra fittings and special heavy shorings installed to support the weights. Of course, you pay not only for the work of installing all these special fittings but for their ripping out afterwards; and, in addition, you pay for all the time the ship lies idle in port at both ends of the trip, plus the actual cost of transportation.

I have heard considerable adverse criticism about bringing home the ex-German ships, but from a business point of view it was not such a bad venture. The carrying home of four large naval guns by the *Ostfriesland* represents a very neat sum saved, not to mention the release of cargo carriers which otherwise would have had to do the work at the expense of considerable loss of time. Besides, almost two years had elapsed since the armistice, and our guns were still in Scotland waiting for available bottoms to bring them home.

It has been stated that the actual saving in transportation charges represented approximately twice the amount of money allowed me by the Department for the fitting out of the entire five vessels. This may or may not be accurate, but it can not be far wrong.

At Brest, France, we made our final preparations for our long leg home, taking all stores remaining at Brest from our large "War Naval Base" there. In addition, all the Navy dead which had been disinterred in France and which were ready for shipment, were placed on board the U. S. S. *Hancock* for transportation to New York.

Prior to our departure from Scotland we had been limited in the amount of coal we could take. We therefore had to fill our bunkers at Brest where the French Navy Department owed us a considerable amount of coal. We soon discovered one reason why the French Navy was staying in port—German coal. The only coal the French had to give us—they were trying to use it themselves—was coal delivered from Germany. I received a cablegram from Captain Kimberly of the U. S. S. *Chattanooga*, sent from the west coast of Africa, warning me about the German coal. However, we had to take that or nothing. No further remarks need be made except to note that we could

not reach America with three thousand tons of such trash. It was a mixture of slate, slag, sand, and dirt, which formed a blanket-like cake in the furnaces extending over a large section. To slice this was practically impossible. The trip home with such stuff was a "man-killer" down below.

In my entire career, I have never seen so many heat prostrations. These were the result of poor ventilation, high temperature in the fire rooms, and heavy work—occasioned by the poor coal—beyond the endurance of the fire room force. Even the more experienced men could not stand the work; and, before the trip had fairly started, calls for help from the deck force were made, and continued throughout the voyage. We averaged about five to seven heat prostrations every watch.

Due to poor quality of the coal and also to a serious casualty which occurred, I had to change my plans and go into Punta Delgada, Azores, where we found some real coal, and made our repairs. On reaching New York, we could not even give that coal away. A board of engineering officers analyzed it, and found it so inferior in quality, so low in B. T. U.s, that they recommended leaving it in the ship. It would not even pay to take it out of the ship, and about one thousand tons of that coal still remain in the *Ostfriesland* and the *Frankfurt* as a reminder of how the Germans are living up to their peace terms regarding the delivery of coal to France.

At Brest we had another redistribution of personnel due to our having to send one hundred and twenty-nine men to the U. S. S. *Pittsburg* in exchange for short-timers, G. C. M. and B. C. D. prisoners, and others that had to be sent home. This caused a slight delay as we again had to train men in the handling of auxiliaries before we could risk going to sea. The *Ostfriesland's* electrical auxiliaries, of which there were a number, required special training before we could undertake the towing of the *Frankfurt*, as our trip from Rosyth had amply proved.

We sailed from Brest, France, on the thirteenth day of July, the *Ostfriesland* taking the *Frankfurt* in tow outside. Prior to our departure from Rosyth, we had prepared our towing gear very carefully, allowing an ample factor of safety on everything. Everyone was thoroughly indoctrinated so that the plans would be quickly carried out. Complete special signals were arranged

to cover probable occurrences, and to insure that all ships would quickly grasp the situation.

One elastic cruising formation was arranged in order to demand the least variation in the steaming of the separate units; at the same time to insure that all units were continuously within easy signal distance. As no ship except the U. S. S. *Hancock* had more than one radio operator we were dependent on visual signals. Our radio operators stood watch in rotation by ships in order to maintain a continuous radio watch for outside calls. The U. S. S. *Hancock* was the only one that could send a message any distance, the rest of us having small field sets, but we could all listen in. Radio communication was maintained throughout the trip by the U. S. S. *Hancock,* first through European stations, then through the Azores, and finally through Cape Race. Only one day were we out of communication, and that day we relayed our messages through a merchant ship. The U. S. S. *Hancock* deserves credit for her fine work.

The towing gear we rigged consisted of a six-inch steel wire bridle, one complete round turn of which was taken around the barbette of our after turret. Both ends were led aft, each on its own side of the deck, and through the midship stern chock. Solid thimbles were spliced into both ends. These ends were shackled to a three-inch heart shackle by two two-and-one-half-inch Navy standard towing shackles. Shackled into the outboard end of the heart shackle was a three-inch pelican hook which hooked into the forward shackle of the tow line.

The tow line consisted of two six-and-one-quarter-inch galvanized steel wire lines, each one hundred and fifty fathoms long, shackled together with two two-and-one-half-inch Navy standard shackles, back to back. Solid thimbles were spliced into both ends of both tow lines. The towing shackles were tested to sixty tons, and the heart shackle and the pelican hook, to eighty tons. The after shackle of the tow line was shackled into the *Frankfurt's* port chain, which was veered to forty-five fathoms. A three-inch wire messenger was attached to the tow line by a chain strap about twenty feet abaft of the pelican hook, and was secured on deck.

As a preventer, the *Kearsarge's* bridle—entirely inadequate for the purpose for which sent over—was rove through the three-

inch heart shackle and both ends were led forward on deck. Its inadequate length was supplemented by eight parts of one-and-one-quarter-inch steel wire by which its ends were secured to the bitts on both sides of the quarter deck. Where the preventer passed through the heart shackle, chafing gear was put on.

A special towing hawser capstan on the starboard side of the quarter deck fitted with twin vertical drums, scored to take large-sized hawsers, was of great assistance in handling the line, as was also a very fine hawser controller placed well aft on the starboard side of the quarter deck.

In leaving Brest, the sweepers and their respective ex-German destroyers left the inner harbor first, immediately followed by the *Frankfurt* in tow of a large French tug. As soon as she was clear, the *Ostfriesland* stood out, followed by the U. S. S. *Hancock*.

On reaching a prearranged point in about forty-five fathoms of water, the French tug dropped the *Frankfurt* and the *Ostfriesland* picked her up, running the tow line with a five-inch hauling line. It took us about twenty-eight minutes to run the line and make fast. Our cruising formation consisted of the *Ostfriesland* towing the *Frankfurt* forming the center and guide unit. One thousand yards on my starboard side was the U. S. S. *Rail* towing the ex-German destroyer *S-132*. An equal distance on my port side was the U. S. S. *Falcon* with the *G-102*. The *Rail* and *Falcon* had orders to maintain such position that they and their respective tows were abeam of the interval between my stern and the *Frankfurt's* bow. My idea was to present a solid target on either beam in order to discourage anyone's trying to cut through between my stern and the *Frankfurt's* bow—she was being towed with a tow line two thousand and seventy-five feet long—and coming to grief.

The U. S. S. *Hancock* took her position astern of the *Frankfurt* and slightly on her starboard quarter, with instructions to maneuver in case anyone went overboard from either the *Ostfriesland* or the *Frankfurt* as we could not very well do anything with such a long tow line out, and the *Frankfurt* could do nothing.

The U. S. S. *Red Wing* took position on the port beam on the *Hancock* and split the interval between the *Ostfriesland* and the *Falcon*.

This formation was very elastic and allowed any unit to jockey forward and aft without affecting any other unit, thereby saving fuel.

In spite of my efforts to discourage any vessel's trying to cut through our column, on two occasions, both at night, vessels acted as if they contemplated trying it. In the first instance, a large, brilliantly lighted vessel, probably a passenger ship, tried to cross from our starboard side, changed her mind, made a complete circle and crossed astern of the formation. In the second instance, a tramp whose officer of the watch was either dozing or about the deck attending to the many duties that fall to the lot of the officer of the watch on a tramp, crossed our course close ahead. When he discovered his position he did his best to get out of it and succeeded after a fashion, assisted by our easing off to help him out.

In both instances, our efforts to learn their names proved unsuccessful.

From the point of view of economical steaming, the formation was ideal. Fortunately, there was no occasion for the *Hancock* to render any assistance to either the *Ostfriesland* or the *Frankfurt* in picking up men, but one afternoon it became necessary for the *Hancock* to stand by the *G-102* and to send medical assistance to that vessel. As long as possible, I watched with keen interest and pleasure the skilful handling of the *Hancock* in going close aboard the *G-102* while the rest of us steamed ahead at slow speed. The transfer of the sick man in a stretcher from the deck of the rolling destroyer to the boat alongside, and the quick hoisting of the boat with the stretcher case in it to the deck level where the man was passed in on deck was a pretty piece of work, but just what you would expect of Captain Church, who earned his reputation years ago in the old second flotilla. From the time the signal was sent the *Hancock* to stand by the *G-102* and render what assistance the circumstances demanded, until she was back in formation and we were all again at standard speed, was approximately forty minutes. In laying out our course home, the primary object was to get there with the least wear and tear on equipment and personnel, the former of which was unreliable; and the latter, short. I therefore hunted good weather, and naturally laid my course across all the "two per

cent blocks" on the hydrographic weather chart. I wish here to pay my respects to the accuracy of the hydrographic office's charts. We had "hand picked" weather all the way home, and seas that gave us only an easy comfortable motion; that is, if you do not ask the *V-43* what kind of seas we encountered. Her rolling was a constant source of amusement to the rest of us. Before leaving Scotland, I realized that Brest would be our last chance for oiling the sweepers. With this in mind, and also to give the ex-German destroyers more stability, instructions were given to prepare their fuel tanks for oil, and to fill them promptly on arrival at Brest while awaiting my arrival there. It was my intention to send the sweepers into Punta Delgada with their destroyers to refill with oil, each from his own tow. As soon as a landfall was made on St. Michael's island, the rest of the convoy was to have slowed down and proceeded at reduced speed along the South coast, while the sweepers speeded up and carried out their part of the program, rejoining us as soon as possible. The first part of the program was carried out. We also slowed down but only because we could not make port and get all ships inside the breakwater before dark. Owing to the serious condition regarding our coal consumption, and also the repairs that were absolutely necessary for safety, we had to go in to Punta Delgada where we remained one week coaling and refitting.

A long towing trip like this one is a standing invitation for all sorts of accidents even if you start with ships in good condition, but to attempt such a trip with ships that had been purposely scuttled by their crews, or stripped and purposely injured as had been the *Ostfriesland,* is a guarantee against a too-monotonous trip. As was expected, we began having trouble within six hours after leaving Rosyth even though we had anticipated everything possible. On our arrival at Brest, we made necessary repairs, and within a day after leaving that port, other trouble developed. The combination of towing, transporting heavy weights on deck, and the known condition of tow engines soon resulted in serious trouble, and our insistence on putting all three engines in commission before leaving Rosyth was soon justified.

Lieutenant-Commander Karl Smith, U. S. Navy, our chief engineer, can not be given too much credit for the results accomplished in the preparation of the *Ostfriesland's* engineering department for the trip home, and his resourcefulness in meeting all requirements during the trip home. I do not believe there are many officers who fully appreciate what a tremendous undertaking Smith had. Some of the situations that developed, necessitating accurate knowledge and quick action, gave Smith an opportunity to demonstrate his technical ability, particularly in electricity. Time was such an important factor that it had to be kept constantly in mind in all our operations.

That we beat the estimated time for the refitting of the five ships by forty-eight days was not because the work was easier than anticipated, but because the executive officer, Commander B. Dutton, Mr. Smith, and all hands forward and aft, worked day and night to make a daily showing. Our aim was to accomplish something definite each day, and it was remarkable to see how that spirit spread through the entire ship's company.

The plans were so carefully laid and so closely supervised that all work in all departments was completed within forty-eight hours after the completion of our dock trials at Rosyth. Only by perfect coöperation could such results have been accomplished, and everyone connected with this task deserves credit for the expedition with which the work was accomplished.

Due to repeated transfers of enlisted force, the personnel had to be trained three times before we finally started home. This in itself was a problem for the engineer officers because of the unfamiliarity of our bluejackets with the German equipment, valves, auxiliaries, etc. A couple days out from Brest we began having serious trouble with the starboard main engine. The middle engine was coupled up, and without stopping the other engines, the starboard one was stopped and the starboard high pressure connecting rod was swung and the main bearings were lifted twice within twenty-four hours. The execution of such repairs without dropping out of formation reflects great credit on the entire engineer force. Many incidents occurred on board all ships in the convoy, some laughable; others not. Owing to the transfer of men to the ships remaining on the European station and the receipt of their short-timers and others, we bene-

fited in one way as we obtained more experienced men. On the other hand, we suffered, as we also received some of the worst element of the European station, the G. C. M. and B. C. D. men. A few days before reaching the Azores, we had a serious accident in the steaming fire room. A six-inch suction line from a sea valve carried away just inside the skin of the ship and in an almost inaccessible place. Before temporary repairs could be effected, the fire room was badly flooded. On arrival at Punta Delgada, the local repair plants wanted a week's delay before starting repairs and a week for the repairs. Not relishing such a delay, a search was made of the *Frankfurt* and a pipe was found that would answer very well. The modifications to this pipe and its installation on the *Ostfriesland* required one week only. After leaving the Azores, we encountered very warm weather, and as the *Ostfriesland* was built for service in the Baltic and North Sea, the result was soon apparent. So many men from deck were sent below to fill in that we were finally reduced to the helmsman, a quartermaster, a lifeboat's crew and the tow line lookout. The officer of the deck was his own lookout, and the junior officer of the watch—a warrant officer—was messenger and all the rest of the deck details. The night before we arrived off New York, the *Frankfurt's* helm jammed hard left and for a few minutes it looked like an all-night's task, picking up our tow line. Fortunately our good luck did not forsake us, and we did not part the line. Before reaching shallow water, we took in the forward section of our tow line, and shackled the three-inch pelican hook into the forward shackle of the second section of the tow line. On reaching Ambrose Channel Lightship, the *Frankfurt* let go the line and, on heaving it in, we found it brightly polished by its few hours' towing in shallow water, as we had expected.

We all sighed a deep sigh of relief when the line was finally reported in on deck, and we were free to start in to port minus our tow, which the navy yard tugs had picked up.

"Der Tag" dawned for us on the ninth of August, 1920, when we stood in to New York harbor on the fifty-fourth day after our departure from Rosyth, Scotland.

As we passed the Goddess of Liberty, I could not help recalling the story of the arrival in New York long after the

armistice of a solitary negro trooper on a transport loaded down with white troops.

He was hanging over the port rail forward watching everything with keen delight. Suddenly he looked up as the transport was passing the Goddess of Liberty and, with a broad grin, sang out: "Put down yo' light, honey, I'se home."

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A SIX-YEAR COURSE AT THE NAVAL ACADEMY

By Lieut. W. O. Henry, U. S. Navy

All of us who are interested in the Navy are interested to a greater or lesser degree in the Naval Academy and quite often give voice to some idea that is in our heads concerning it—sometimes knocking—sometimes offering a bit of constructive criticism which is usually poorly thought out with not a very good conception of just what is going on in the Naval Academy at the time or the result on the whole scheme of things in the Service.

Now I have an idea (and of course referring to the above statement, I will say it is good)—I must say for it that I am whole-heartedly behind it, and have considered putting it through a feeble pen for several years, also that I do not believe that everybody else is all wrong and would be willing to be convinced that somebody else's ideas in parts of it are better than my own. I believe in it, now see what you think about it, then show me where you disagree.

Let us consider first, just what our object is at the Naval Academy—our object is to lay the keel of an officer; to give the midshipmen the fundamentals that John Paul Jones calls for when he tells what an officer should be. (You have read the extract from his letter that is printed on the bottom of your fitness reports—a little Bible all in itself, that extract.) I hope you are agreeing with me so far. We do not wish to turn out an admiral, or a lieutenant or even a good ensign, but we do want to turn out a man—a gentleman (not necessarily a Chesterfield)—an embryo officer who will shortly be a good ensign with the love of the service cast in his heart and the

ambition to work and fit himself for his duties firmly fixed in his system. Do we do this now or have we done this in the case of most of our graduates for the past good many years? And if we have done it have we made as good a job of it as we might have done?

As we go at present a youngster leaves the Naval Academy after a very hard four years of routine life—crammed full of work, study and some play. In his different courses of study he has assimilated many things, some very hazily, with no resulting clear impression of the subject, and some things perhaps too much in detail to be of use to him in anything except some particular detail on board ship. He leaves the Academy sick of books and a good many "of him" sick of the Naval Academy —expressing the wish that he may never see the place again. Some of these, ensigns they now are, have a love for the Service, others will develop it, and some others never will. Very few understand the customs of the service, haven't the loyalty which they should have to those above them and the service as a whole. The only ships they have seen or cruised on are ships thrown hurriedly into commission with makeshift crews—dirty below and doubtful as to their cruising ability. The ship's organizations they have seen and been a part of are too ofttimes makeshift affairs put into effect by an overworked executive officer who has just joined, and has had a "hard row to hoe" with his ship and his crew. This ensign has seen officers of all sorts, most of them temporarily attached, to say the least of the matter (expecting to go to a real ship soon), some of indifferent caliber and others unquestionably unqualified for their rank. Some of this lately has been due to our "after the war" difficulties—but why so, necessarily? Do not we all of us learn more by example and seeing than we do out of a book and hearing? If we do not produce good officers how will we have a good Navy? If we do not give the midshipmen the best that we possibly can, show them things that are done properly, take them to sea on ships that are ships and not floating mechanisms with a gang of men aboard, how may we expect to commission them as ensigns and expect them to very shortly carry out the duties of a line officer according to the standards we have set? Even if we did send a midshipman to sea on his summer prac-

tice cruises on number one ships—does he have the time or the opportunity to acquire a good knowledge of anything? He joins his ship more or less "done in" from the academic year and starts in with a mapped-out schedule of duties, watches, notebook work, and study—the study especially he needs a rest from. In three months' time he barely settles down aboard ship. He feels that he is only a temporary factor in the life of the ship, and unfortunately, some of those above him lead him to believe just that very thing, that he is in the way and hindering progress rather than making him feel that he is a part of the ship, and of value. It wouldn't matter whether he was of any value at the time or not, he should think that he is. His potential value is great and what is more, great either for good or for bad.

This is not altogether about the cruises of midshipmen, but concerning their training as a whole. I maintain that we do not teach them:

1. The proper loyalty to their seniors. (That the King is King and that the King can do no wrong, etc.)
2. Love of the service.
3. Enough sailor man stuff.
4. Enough general knowledge of the Navy and of the sea.
5. Enough literature, international and world politics, public speaking, logic, psychology, and perhaps for some, enough polish. Also that we teach few subjects as thoroughly as we wish. The system of instruction we believe is good—but there isn't enough time allotted to the different courses to get the most out of them.

Above all there is no opportunity for a midshipman to get a "liberal education." His work is virtually all technical. Time cannot be spared from his daily routine to attend lectures on subjects of special or general interest. He gets a very good technical education—but where else, or in what other institution is there given a full technical education in four years, and of such a complex nature as the one at the Naval Academy added on to the foundation of a high school training only? The midshipman never gets a college education and to have a "liberal education" and at the same time be a naval officer he should get both. The course at the Academy has been added to and added to until it is a continuous grind from beginning to end, and less and less time is given to the development of character and es-

pecially military character, and the fundamental good human qualities that we must have in an officer. Character can't be taught, but it can be developed. The course of study and a midshipman's life while at the Naval Academy can be so planned that he involuntarily would have injected into him that loyalty to and the love of the service which stands first in the prime requisites of an officer. If he does not get those qualities which we maintain are the fundamental good ones ingrained in his character, we can get along better without him.

I propose a six-year course to include virtually everything that is given now with a very few additions. Two of that six years to be at sea—and not at the end of the four years' academic work, but sandwiched in between. In making the course a six-year one, I believe that we can turn out better officers—better sailor men, instill into them a love for the service and also the Naval Academy; make the school a pleasant and happy place to be in, and the cruises jaunts to be looked to with pleasure, also good enough in themselves to be something of an education. To make the cruises good we must leave most of the textbooks behind. Some few subjects, plain schooling, can be taught as well at sea as on shore, thereby lightening the regular academic work and padding out a few meager spots. I have in mind English and literature. Are not most of us woefully lacking in speaking and writing well, and even a common knowledge of the classics? Some will say that all such is unnecessary; however, would it not be a pleasure to have a good professional and technical foundation and added to it the power to express one's thoughts forcibly and well on every occasion in any company? The English course as it exists requires two and a half years. Little time can be given to reading any other than textbooks. I believe that the whole two-and-a-half-years' course could be completed and more gotten out of it on one cruise than is now done at the Academy, and what is more to the point, the midshipmen themselves would enjoy it. With work in English done on two cruises and a little time given to it at the Academy this course could be made really worth while.

Now we are not making cruises to teach English—but the cruises will be of such a nature that English and subjects of like nature that require reading only can be studied to advantage

while on them. The six-year course is outlined generally as follows, starting with the new man as he enters and following him through to the end of it;

I. Plebe summer—new sixth class.

II. First academic year at end of which designated fifth class.

III. Leave for the fifth class until July twenty-second, approximately.

IV. Sail on first cruise about July twenty-fifth.

V. On June tenth, approximately, designated fourth class.

VI. Return to Academy about July twenty-fifth and go on leave until about September fifteenth.

VII. Second academic year at end of which designated third class.

VIII. Go on leave until about September fifteenth.

IX. Third academic year at end of which designated second class.

X. Go on leave until about July twenty-second.

XI. Sail on second cruise about July twenty-fifth.

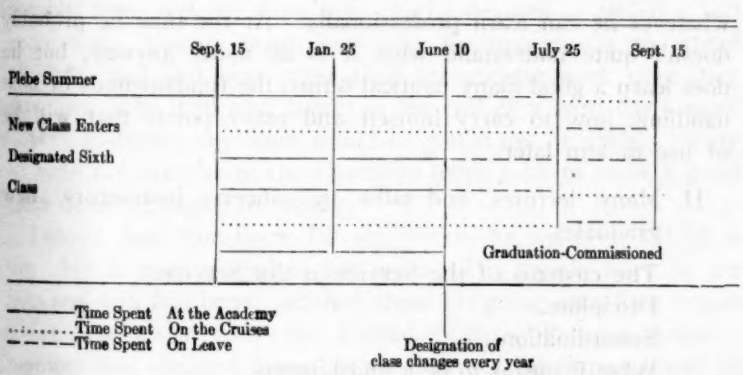
XII. About June tenth designated first class.

XIII. Return to Academy about July twenty-fifth.

XIV. Go on leave until about September fifteenth.

XV. Fourth academic year at end of which:

XVI. Graduation—commissioned.



The diagram shows the status of one class for the six years. Other classes dovetail in for a complete cycle.

The academic year is about three weeks longer than at present.

All leaves are longer, one in the middle of the course for about three months.

The cruises are of one year's duration, during the second and fifth year.

There are always four classes at the Academy.

Classes are called one to six inclusive. First class to Plebe respectively.

The same two ships, or one ship if the classes at the Academy are smaller than at present, would not make two successive cruises.

The ports of call should not be the same for the two cruises of any class.

Plebe summer to remain as it is now with additional lectures and talks.

I. The usual drills.

Seamanship.
Infantry.
Rifle Range.
Steam Engineering.
Gymnasium, etc., as now outlined.

All of which is to build up bodily health and physique, teach the Plebe the fundamentals of discipline and subordination, and whatever he can learn professionally. At the time he probably doesn't quite understand what it is all about anyway, but he does learn a good many nautical terms, the fundamentals of boat handling, how to carry himself and many points that will be of use to him later.

II. Many lectures and talks by officers, instructors, new graduates.

The customs of the Service in the Service.
Discipline.
Subordination.
What it means to be a midshipman.
The Naval Academy.
Athletics.

Ships and sailor men.

Esprit de corps.

What the Navy has to be proud of, and what the Naval Academy has to be proud of.

Commands and orders.

The honor system.

Hygiene, etc., etc.

All of the above, and more, to start the new man into the path of right thinking—good living, and plant the seed of the right kind of an unbeatable *esprit de corps.* If the Marine Corps expanded several times over during the war and made virtually every man in it feel that he was somebody, and that the Marine Corps was just about the best organization on earth, why can't we make the small regiment of midshipmen feel and believe the same thing? Crusty old sergeants spent as much time talking to their recruits as they did drilling them and—to the very best purpose—pride in their organization. A midshipman should be proud of being a midshipman and of the Naval Academy before anything else. The remainder will follow:

THE FIRST ACADEMIC YEAR

In regard to this let us make it less of a grind—don't crowd so much into a day—let it end by four o'clock and preferably sooner. By ending the day at least by four o'clock, and preferably three o'clock, more time can be devoted to athletics and recreation. Varsity teams will have the opportunity to attend all drills and still have more time for athletic work than they do now. The drill now comes at the end of a hard day's work—with a shorter day more would be gotten out of drills. Plenty of time for exercise in the afternoon helps a lot to make a good clear head at night for study.

Leave: send him home for six weeks—he wants to tell off a bit. He is mighty glad to get home. His people want to see him and will feel better satisfied about his going on a long cruise—far, far away from the United States, "Podunk—home—mamma and civilized folks," when they see his improvement in health, looks, and bearing. He should believe that he is in a wonderful place and if he does his people will also, and be con-

tented concerning his associates and surroundings. Their contentment will reflect again on his own attitude. Tell him all about the cruise he is going to take when he comes back—the ships he will go on and the ports he will visit.

HIS FIRST CRUISE

1. Start it about the middle of July; he is now a youngster or fifth classman, and thinks that he knows a lot, he will soon be trying to learn a lot. My idea is for this cruise to last about one full year—cruise around the world. All the fifth class and all the second class will be on it. When the cruise is over they will be fourth class and first class respectively. At the present time, such a cruise would call for two ships—preferably dreadnaughts, these ships to be good ones, officered and manned from stem to stern by the very best. Picked enlisted men, who can act as instructors, have the best ideas of the Service and a love for it. Skeleton crews only they will be, the midshipmen will fill in the remainder and do virtually everything that is done on board, and they will spend enough time on every job to "get good at it." The ships should not be overcrowded—plenty of room to eat and sleep—tables to work and write on—ships clean and in good shape when they start on the cruise.

Perhaps it would be hard to get enough enlisted men of the caliber we want to make up the skeleton crews of two ships. Let us send the best we can find, however. Midshipmen get many ideas and a lot of first-hand knowledge from them. I will not go further into detail and outline a cruise program for midshipmen. We want to keep them busy but at the same time allow a fair amount of time for recreation and sleep. There will be plenty of ship's work to do and they won't mind doing it—but don't overwork them with drills and study.

The object in taking the first cruise after the first year is to give the youngster a good idea of what he is going to do. To start a liking for going to sea in his heart, with good ships inside and an interesting cruise, nine out of ten I believe will soon be absolutely contented and happy. The cruise will be a reward for a successful completion of the first year's work—a thing to be looked forward to with pleasant anticipation, rather

than just a bad three months to get by with in one fashion or another.

The cruises will be an incentive for better work at the Academy. They will be an advertisement for the institution and will attract boys to enter who will be of the very sort we need in the service. Officers will like to make them—so will the men. Very few do now. Nearly all officers and all men like to go to sea on a real ship, be it large or small, but just so long as he feels that he is at home and not on a camping-out trip.

These midshipmen practice cruises should be the very best that the Department can make them. No trouble or reasonable expense should be spared in carrying them out from the beginning to the end—then they will be good. When midshipmen finish such a cruise they know a great deal about things in the Navy. They will be proud of the fact that they are in it—and when they go home they will have every red-blooded youngster in "Podunk" wishing that he were a midshipman. It would be a good time to weed out the few first classmen that still show lack of interest or plainly will not make officers. In a year's time on board ship I believe that this weeding out could be done with little or no chance of error.

Now I do not think that a ship is the ideal place to run a school in; at the same time I do believe that English, international law, naval history, history of the places visited and people in them, foreign customs and perhaps some modern languages, could be studied easily on board ship. Most of such work would take up the time midshipmen now devote to "Harry, the Left-Handed Poker Player," and "Susan, Queen of the Movies." Of course a boy's hair likes to stand up on end a part of the time —but he will have plenty of time to do good reading and pore through a few "thrillers" also. Yes, let us send some English professors along. The course in English at the Academy could be made much better and at the same time fewer hours devoted to it during the years spent at the Academy.

During the cruise the youngsters will do virtually everything on board ship—fire boilers, scrub decks and paintwork, chip redlead and paint, stand watches in all parts of the ship. I would suggest a watch in five at least. Remember that the midshipman is doing more than the seaman second class does—he

is studying some all the time, is pretty young and growing and needs a fair ration of sleep—does more than just eat, work, and sleep. If the routine is too stiff, any study at all will be a grind and worse than useless.

The books he needs on the cruise are, *Seamanship, Bluejackets Manual, Boat Book,* English books, and a good library.

On the completion of the cruise, about the middle of August, he goes on leave, to return the latter part of September. He is a proud boy now sure enough. Perhaps he has the "swell head" but it is a disease usually cured by a few knocks and several years. Most boys get it at about this time of life—it's as natural as the usual physical ailments.

Now for another academic year with work not so heavy as at present, especially English. The cruise will have helped him a great deal in the study of his professional subjects which he will get the following year. The academic year could extend to about the middle of June. A longer academic year will also ease up the work per day.

Then send him on about three months' leave, to return the first or second week in September.

Now for another academic year lasting until the middle of June or thereabouts. This year will be easier, anyway, if he has benefited by his first cruise.

At the end of the third academic year and the fourth year at school—off on leave again—about six weeks.

Then his last midshipman cruise. On this cruise he takes navigation books for study—*Seamanship, Electricity,* and English books for reference. He would spend more time with strictly professional work—but a little with English and languages. Most of the time he would be doing junior ensign duties, and the remainder, the duties of all the leading ratings. He should by now be learning an officer's point of view, learn how to lead his gang, take charge of almost any job about the deck or down below.

At the end of this cruise, first class year would be very easy and I believe he would in the main make an excellent regimental officer on account of his last year aboard ship. His last year at the academy could well be utilized in giving him more junior officer instruction, more international law, studies of foreign

navies and types of ships—more school of the ship, and ship handling, using tugs or destroyers. There would be time for a great many lectures on such subjects as leadership, international law, world politics, the elements of strategy and tactics, and so on.

When he graduates at the end of his last academic year, I believe you will have an ensign or a man who will be an ensign after a very short time aboard ship. He will love the Naval Academy and the Navy. He will have the good technical education a line officer should have, and have the liberal education and training to make him feel at ease in any company. He will be an asset to the Service. His junior ensign's work will come easily. He will not be carried as a liability on board ship for a year or so. His rank will be respected by those below him and he as an individual will be as soon as he steps on to the quarterdeck.

There will be no reason for the executive and first lieutenant to say, "The Navy School has certainly gone to hell"—but on the contrary they will feel proud of their institution and perhaps say to themselves, "He is better than I was when I started."

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NEW GERMAN FLEET POSSIBILITIES

By Colonel Constructor E. de Vito, Royal Italian Navy,
Chief of Design Division, Ship's Design Committee

1. French Fears

The small fleet allowed to Germany by the Peace Treaty is:
Six battleships, *Deutschland* or *Lothringen* type;
Six light cruisers;
Twelve destroyers;
Twelve torpedo boats;
No submarines.

These ships may be replaced after a period of twenty years by battleships and cruisers and after fifteen years by destroyers and torpedo boats.

But the displacement of the new ships must be no more than:
10,000 tons for battleships;
6,000 tons for light cruisers;
800 tons for destroyers;
200 tons for torpedo boats.

French naval authorities and French Parliament fear that Germany will build new fast ships observing only the prescribed tonnages, but eluding the clauses about the type.

Mr. Guist'hau, the French Minister of Navy, in the naval debates of the French Parliament (June, 1921) has said that the Supreme Council increased from six to eight the number of battleships and of cruisers allowed to Germany. He has said also that in the next year[1] all these battleships and cruisers will be more than twenty years old and therefore they may be replaced by 10,000-ton and 6,000-ton ships.

[1] Really that happens in 1926.

Mr. Denise, the referendary of French naval bill, in the same debates has reported, without adhering to it, the opinion that Germany might build cruisers of 10,000 tons instead of armoured battleships; he also referred to a printed book in which it is said that Germany might launch sixteen cruisers to menace the safety of French maritime communications.

But actually Germany needs a policy of concentration and of intense work; therefore it does not appear possible either that Germany will rebuild many warships, or that she will elude the clauses of the Treaty, and even if Germany would make an effort she should develop rather aerial warfare.

However, it may be interesting to examine from a purely technical point of view what it is possible to build with the small displacement prescribed by Peace Treaty.

2. TORPEDO CRAFT

As Germany cannot build submarines she will be forced to develop torpedo craft. A torpedo boat of 200 tons at forty knots requires about 12,000 horsepower and this notable horsepower might be obtained by gasoline marine motors[2] acting on the shafts by reduction gears (I propose Parsons type) when the question of simultaneous reversing of motors and silent running will be solved.

The weight of such machinery, complete, at the rate of about 150 horsepower per ton might be about eighty tons. Following is the table of weight suggested.

Hull and outfit	tons 70
Equipment	tons 10
Machinery	tons 80
Fuel, normal	tons 15
Armament	tons 25
Displacement	tons 200
Fuel capacity	tons 60

The ratio of fuel capacity to the normal weight of fuel is very large; indeed, it is a little greater than in the most recent British

[2] As applied in lower degree, on motorboats, and as suggested for first line battleships by Commander de Feo (R. I. N.).

and French light cruisers; but it may be a means to increase the displacement without eluding the clause of the treaty.

The weight of twenty-five tons allotted to the armament is sufficient for one 4″ anti-aircraft gun and two 21″ torpedo tubes.

A destroyer of 800 tons at forty knots requires about 36,000 horsepower and this power may be obtained with a combination of 16,000 horsepower light steam machinery and 20,000 horsepower gasoline marine motors acting by gears on the shafts.

The weight allotted to the armament is sufficient for three 6″ horsepower per ton for steam machinery, and of 150 horsepower per ton for gasoline motors, maybe less than 370 tons. The table of weights might be:

Hull and outfits	tons 280
Equipment	tons 35
Machinery	tons 370
Fuel (normal)	tons 40
Armament	tons 75
Displacement	tons 800
Fuel capacity	tons 160

The weight allotted to the armament is sufficient for three 6″ guns and two double 21″ torpedo tubes.

3. ORDINARY SOLUTIONS

Coming now to battleships and cruisers, what is possible to build with 10,000 tons and 6,000 tons?

It is clear that if classical and ordinary solutions are given to the question, one falls in the ordinary cruisers of 10,000 or 6,000 tons, armed with 8″ or 6″ guns, lightly armoured with 4″ or 3″ plates, horizontally protected with 8″ plating as the usual types that in the last years have been built or designed by the leading navies of the world, like the British *Raleigh* class (9,000 tons, thirty-one knots) or *Emerald* class (76,000 tons, thirty-three knots); the U. S. *Omaha* class (7,500 tons, 33.75 knots); the new French *Bouvet* class (8,000 tons, thirty-six knots).

It is known that United States and French naval authorities have designed and proposed a 10,000-ton type. Average characteristics: speed thirty-five knots, armament 8″ guns, armour 4″ plates. Obviously these ships may menace the safety of maritime

communications and the surety of coastal towns, but they could not at all fight against capital ships.

4. SPEED INSTEAD OF ARMOUR

Lord Fisher suggested to abandon armour, using only big guns and large horsepower for high speed and with such a fleet he promised to be victorious. The French Admiral Guépratte has said that speed is an invisible armour.

Nihil sub sole novi; let us remember that Italian unarmoured and fast battleships *Italia and Lepanto* (1876) were laid down after the heavy armoured battleships *Duilio and Dandolo* (1872).

Is it possible that after the era of dreadnaughts, super-dreadnaughts, and after the paroxysm of leviathan warships we shall return to the same ancient idea—*speed instead of armour*—in order to reduce the displacement for economical considerations?

Lord Fisher was appointed at the British Admiralty in 1905-10 and the first battlecruiser (*Invincible* class) was laid down; when he returned to the Admiralty in 1915 the two last ships of *Royal Sovereign* class were redesigned, becoming the two superbattle-cruisers *Repulse* and *Renown,* and the light battlecruisers of the *Furious* class were laid down.

Rear Admiral Taylor, the gallant director of U. S. naval construction, in a very clear paper has written that the battle of Jutland has given a rude shock to opinions based on earlier actions (Doggerbank, Falkland) followed by the construction of the *Furious, Courageous,* and *Glorious.*

The partisan of speed observes that Admiral Beatty deserved his glory pushing his battlecruiser squadrons between the coast and the German fleet and occupying it until Jellicoe's battleship squadrons could arrive. Admiral Beatty had such possibility, thanks to the high speed of his fast cruisers. To obtain his brilliant object he sacrificed two obsolete cruisers *(Defense* and *Black Prince)* and three modern battlecruisers, *Queen Mary, Indefatigable,* and *Invincible.* These three battlecruisers blew up and sank in a few minutes; three ships of the *Furious* class could perhaps reach earlier the battlefield, but they could not be sunk more suddenly. And partisans of speed ask: what has been the utility of 2,500 tons or 3,500 tons of armoured plates with which the *Invincible* and the *Queen Mary* were respectively overloaded? It may be replied that battlecruisers have supported heavier

punishment than would have been considered possible and that many other ships of this class have survived, not losing their fighting efficiency. But the advocates of speed say that fast ships must be armed with superguns and that they must be used only at a long range.

Lord Fisher left the British Admiralty and died; *Furious* class has been abandoned instead of being perfected. It is known that actually British tacticians—even Lord Beatty—are no longer partisans of speed.

But principles may be different for a strong navy or a weak one; and the limitation of displacement is such a particular condition that it may impose peculiar and perhaps desperate solutions.

5. "HOOD"

According to the idea of many naval men, the world war has demonstrated the value of armour protection, of guns and of speed; the result has been the latest ship *Hood,* a hybrid type between the battlecruiser and the battleship, which was redesigned and laid down just after the battle of Jutland. According to the very interesting paper by Sir Eustace Tennyson d' Eyncourt, the eminent director of British naval construction, the composition of *Hood's* weight may be as follows:

H. M. S. "HOOD"

Hull (and fittings)	tons	14,900	(36 %)
Armour and protection	tons	13,800	(33.5%)
Machinery	tons	5,350	(13 %)
Oil fuel	tons	1,200	(3 %)
Equipment	tons	800	(2 %)
Armament	tons	5,150	(12.5%)
Displacement	tons	41,200	(100 %)
Oil fuel supplements	tons	2,800	
Displacement overloaded	tons	44,000	

The hull's weight includes the weight of decks and side-plating that contributes very materially to protection. Furthermore the hull's weight includes obviously the weight of Outfits or fittings as no other item is specified in the list of percentages given by Sir d' Eyncourt, besides "equipment" which means anchors,

chains, cables crew stores, etc. The item "Outfits," or fittings, refers to deck machinery, steering arrangements, drainage, and ventilating systems, furniture, sidelights, watertight doors, and all accessories of hull. In his interesting paper Sir d' Eyncourt has not specified the distribution of weights between "Steel Structures" and "Outfits," but by comparison with some actual ships it is possible to state that in very large warships the percentage of "Outfits" might be about 6%; then about 30% of the normal displacement may be attributed to the *Hood's* steel structure. The weight of the big gun houses' armour is included in the "Armour and protection."

It may be observed that the weight of machinery (tons 5,350) referred to the trial horsepower (150,000 horsepower) amounts to a rate of about twenty-eight horsepower per ton, that is to say, the relative weight is about eighty pounds per horsepower.

The normal weight of fuel, 1,200 tons, corresponds to about eighteen pounds per horsepower, that is to say, to about sixteen hours of running at full power.

6. LIGHT MACHINERY ON "HOOD" TYPE

The same Eustace d' Eyncourt, speaking before the Institution of Petroleum Technologist, said that he could not concur in the opinion that the time has come to discard the battleship, but that he would consider it *a long step forward* if it became possible to perfect the combustion motor and so increase the power developed in its cylinder that its weight could be reduced proportionately to about that of an airplane motor. He alluded, I suppose, to gas turbine, but obviously the weight of a battleship's machinery cannot be reduced to two or three pounds per horsepower as for aero engines, because the weight of propellors, shafts, thrust bearings, transmissions, reduction gears, reversing apparatus, silencers, pipes, circulating systems, and other auxiliaries, cannot be neglected. I remember an installation of 2,400 horsepower, with very light gasoline motors, which amounted to about fifteen pounds per horsepower and I think that it will be a possibility at least in the near future, a greater reduction of the weight of marine motors under this value.

However, it is not useless to note that a further reduction in the weight of machinery under fifteen pounds per horsepower

could not have a great influence upon the displacement as it is clearly demonstrated in Table I, which has only indicative value.

Actually it is not yet possible to obtain 100,000 horsepower or more, with explosion marine motors, either at the rate of two pounds per horsepower (Case C) or at the rate of fifteen pounds per horsepower (Case B), but it is possible to have similar high power with light steam engines and boilers as on the *flotilla leaders* at the rate of thirty-four pounds per horsepower (Case A), that is to say, with a very reliable type of machinery. In this practical and suitable case with the same characteristics of armament, speed, radius of action, and protection, the displacement of the *Hood* might be reduced from 42,000 tons to 33,000 tons and that is surely a notable economy.

TABLE I

Type *Hood* —Reduction of displacement by reducing the weight of machinery

SPEED		32 KNOTS			
Type of ship		*Hood* original	Case A	Case B Theoretical	Case C Theoretical
Type of machinery			Light steam machinery	Gasoline marine motors	Gasoline airplane motors
Relative weight of machinery		lbs. 80	lbs. 36	lbs. 15	lbs. 2
Horsepower		H.P. 150,000	H.P. 143,000	H.P. 137,500	H.P. 134,000
WEIGHTS					
Armament	tons	5,150	5,150	5,150	5,150
Hull and outfits (36%)	tons	14,900	11,920	10,400	9,620
Armour and protection	tons	13,800	11,940	10,900	10,330
Equipment	tons	800	790	760	740
Machinery	tons	5,350	2,170	920	120
Fuel	tons	1,200	1,130	770	740
Displacement	tons	41,200	33,100	28,300	26,700

Note—The weight of armour and protection has been varied as the power of two-thirds of the displacement

From the deduction above (Table I) follows also that reducing notably the speed of the *Hood* type in order to reduce its horsepower and the weight of machinery, it is not possible, practically, to go under 27,000 tons.

Therefore a further reduction of displacement requires a reduction in the other items.

7. "FURIOUS" CLASS

Returning to the *Furious* and *Courageous* class we derive from Sir Tennyson d' Eyncourt's papers the following data:

H. M. S. *Courageous*

Hull (and fittings)	tons	8,560	(46 %)
Armour and protection	tons	3,440	(18.5%)
Machinery	tons	2,970	(16 %)
Oil fuel	tons	750	(4 %)
Armament	tons	2,230	(12 %)
Equipment	tons	650	(3.5%)
Displacement	tons	18,600	(100 %)
Oil fuel supplement	tons	2,500	
Displacement overloaded	tons	21,100	

Also in this case the hull weights include the weight of decks and side-plating that contributes very materially to protection, and the weights of "Outfits" or fittings. Sir d' Eyncourt has not specified the allotment of weights between "Steel Structures" and "Outfits" but comparing this class of cruisers with some actual ships it is possible to state that for medium displacement warships the percentage of "Outfits" might be about ten per cent and therefore about thirty-six per cent is left for "Steel Structures."

As *Courageous* is shorter than *Hood*, and as the ratio of length to depth is practically similar, the excess of percentage might be perhaps explained with unequal influence of the weight of protection plating, that, as said above, is included in the hull's weight. The weight of armoured places of big gun houses is included in the item "Armour and protection."

The weight of machinery, 2,970 tons, referred to the designed horsepower, 90,000 horsepower, amounts to a rate of about thirty horsepower per ton, that is to say, the relative weight per horsepower is about seventy-four pounds.

The normal weight of oil fuel, 750 tons, corresponds to about eighteen pounds per horsepower, that is to say, about sixteen hours of running at full power.

8. LIGHT MACHINERY ON "FURIOUS" CLASS

We may suppose to use also for the *Furious* class the steam machinery of the *flotilla leaders,* at a rate of thirty-four pounds per horsepower, that is to say, sixty-six horsepower per ton, instead of the actual type of machinery, maintaining the same characteristics of armament, speed, radius of action, and protection, the displacement results notably reduced from 18,600 tons to 16,000 tons.

TABLE II

Type *Furious*—Reduction of displacement by reducing the weight of machinery

SPEED		32 KNOTS	
Type of ship.....		*Courageous* original	Case D Light steam machinery
Weight of machinery per H.P....		lbs.	lbs.
Horsepower.....		H.P. 74 H.P. 90,000	H.P. 34 H.P. 87,800
Weights			
Armament	tons	2,230	2,230
Hull and outfits	tons	8,560	6,340
Armour and protection	tons	3,440	2,850
Machinery	tons	2,970	1,330
Oil fuel	tons	750	730
Equipment	tons	650	520
Displacement	tons	18,600	14,000

Let us consider the case of a 10,000-ton ship with the *Courageous'* armament; we have:

TABLE III

Type *Furious*—Further reduction of displacement by reducing armour and protection

DISPLACEMENT		10,000 TONS	
		Case E Unarmoured and unprotected ship	Case F Light protected ship
Length overall	ft.	700	600
Armament *Courageous*	tons	2,230	2,230
Hull and outfits	tons	4,500	4,300
Armour and protection	tons	Nothing	1,200
Equipment (4%)	tons	400	400
Machinery	tons	2,285	1,285
Oil fuel	tons	585	585
Displacement	tons	10,000	10,000
Horsepower	H.P.	150,000	85,000
Speed	knots	38	32

9. "EREBUS" TRANSFORMATIONS

A third type of warship that appeared, or rather was re-exhumed, during the war, is the monitor type, of which the most

advanced example is the *Erebus*, of 8,000 tons, at fourteen knots, mounting a pair of 15″ guns. Following is the table of weights:

H. M. S *Erebus*			
Hull and outfits	tons	3,440	(43%)
Armour and protection	tons	2,080	(26%)
Equipment	tons	360	(4.5%)
Machinery	tons	720	(9%)
Fuel	tons	240	(3%)
Armament	tons	1,160	(19.5%)
Displacement	tons	8,000	(100%)

It is to be remembered that a portion of the weight of protection is incorporated in the steel structures and then it is included in the hull's weight.

With the same distribution of weights, but using a finer form suitable for greater speed and light steam machinery at the rate of sixty-six horsepower per ton, the same ship might carry about 47,000 horsepower reaching a speed higher than twenty-eight knots.

Let us now consider the same armament of *Erebus* upon a ship of 6,000 tons:

TABLE IV

Type *Erebus*—Increase of speed by decreasing of armour and protection

Displacement		6,000 Tons	
Type of Ship		Case G Unarmoured and unprotected cruiser	Case H Light protected cruiser
Length over all	ft.	700	600
Armament *Erebus*	tons	1,160	1,160
Hull and outfits	tons	2,700	2,580
Armour and protection	tons	Nothing	800
Equipment	tons	270	270
Machinery	tons	1,630	950
Oil fuel	tons	240	240
Displacement	tons	6,000	6,000
Horsepower	H.P.	107,000	62,000
Speed	knots	38	32
Fuel Capacity	tons	1,000	1,000

10. SUPERGUNS

The principle of long range battle requires not only high speed but the most powerful armament of long range weapons; today, that is to say, at least 18″ guns.

As the weight of a two 18″-gun turret with its ammunition is not less than 1,200 tons *without armour*, and about 1,700 tons

including armored gunhouses, it is necessary to increase the weight allowed to armament. With the necessary allowance for secondary and aircraft armament, for torpedo tubes its machinery and accessories, torpedoes, hoists and so on, the weight of *unarmoured* and *unprotected* armament will amount at least to about 3,200 tons mounting four weapons of 18″ and at least to 1,600 tons mounting only two weapons.

For ships of 10,000 tons and 6,000 tons mounting respectively four and two 18″ guns the subdivision of weight may be:

TABLE V

10,000-ton and 6,000-ton ships—superguns and speed instead of armour

DISPLACEMENT		10,000 TONS	6,000 TONS
Type of Ship		Case I Unarmoured and unprotected ship	Case J Unarmoured and unprotected cruiser
Length overall	ft.	600	600
Armament (18" guns)	tons	3,200	1,600
Hull and outfits	tons	4,300	2,580
Armour and protection	tons	Nothing	Nothing
Equipment	tons	400	270
Machinery	tons	1,600	1,150
Oil fuel	tons	500	400
Displacement	tons	10,000	6,000
Horsepower	H. P.	107,000	76,000
Speed	knots	34	34
Fuel capacity	tons	1,800	1,300

But if it is wanted to increase the speed nearly to forty knots it is necessary to reduce the weights of some other items.

11. LIGHT HULLS OF CARGOBOATS

A further step might be the appliance of some courageous reduction of the hull's weight. Before making a comparison between the weights of hull and outfits of cargoboats and those of warships it is necessary to pay attention to the point that the former are referred to full load displacement and then for comparison purpose with warships it is necessary to suppose the latter overloaded at full capacity of fuel.

For instance in the case of the battlecruiser *Hood* the hull's percentage—thirty-six per cent referred to 41,200 tons normal load displacement, becomes about thirty-six per cent when referred to 66,000 tons overloaded displacement. Again, in the case of the cruiser *Courageous* the hull's percentage, forty-six per cent, referred to 18,600 tons normal load displacement,

becomes about forty-one per cent referred to 21,000 tons overloaded displacement.

As it has been stated, the hull's weights of *Hood* and *Courageous* include the weights of outfits.

It is well known that for cargoboats the weight of steel structures of the hull may be less than twenty per cent of displacement, outfits not included. In wartime, owing to the deficiency of steel, many standard ships have been designed in United States and in England. For instance:

TABLE VI

Weights of hull and outfits in British standard cargoboats

British Types	g		n		a & b		e		c		d	
	tons	%	tons	%	tons	%	tons	%	tons	%	tons	%
Displacement	16,000	100	14,500	100	11,375	100	9,910	100	7,200	100	4,750	100
Deadweight	10,800	67.5	10,600	73	8,175	72	7,020	71	5,050	70	2,980	63
Lightweight	5,200	32.6	3,900	27	3 200	28	2,890	29	2,150	30	1,770	37
Machinery	1,350	8.5	600	4.2	570	5	570	5.8	460	6.6	420	8.7
Hull	3,200	20	2,650	18.3	2,225	19.5	1,920	19.2	1,390	19.4	1,110	23.3
Outfits	650	4	650	4.5	405	3.5	400	4	300	4.2	240	5
Length	ft. 450		ft. 411½		ft. 400		ft. 370		ft. 331		ft. 285	

It appears from above that hull and outfits of British standard cargoboats represent from twenty-three to twenty-eight per cent of displacement and that the weight of bare hull alone amounts from eighteen and three-tenths to twenty-three and three-tenths per cent of displacement. Moreover, during the war, Mr. Fisherwood has designed ships of 10,000 tons D. W. for which the weight of the hull's steel structures were reduced even under seventeen per cent of displacement.

Oil tankers have greater strength and better subdivision than ordinary cargoboats; the steel structures of the former absorb a little higher percentage of displacement; for instance:

TABLE VII

Weights of hull and outfits in oil tankers

Type	U. S. S. *Maumee*		Italian Giove-Nettuno		British Standard Type	
	tons	%	tons	%	tons	%
Displacement	15,000	100	10,760	100	11,400	100
Deadweight	10,000	67	7 226	67.2	8,000	70
Lightweight	5,000	33	3,534	32.8	3,400	30
Machinery			490	4.6	570	5
Hull			2,525	23.4	2,425	21.5
Outfits			1,519	4.8	405	3.5

It appears that the weight of "Hull and outfits" of the above named oil tankers amounts from twenty-five to twenty-eight and two-tenths per cent of displacement; the bare hull alone absorbing from twenty-one and five-tenths per cent to twenty-three and six-tenths per cent of displacement.

12. REDUCTION OF OUTFITS

We may at first deduce from Table VI that the weight of outfits in cargoboats is less than half that in warships of the same displacement. In the case of 10,000 ton and 6,000 ton ships the percentages of outfits are as high as ten per cent for warships instead of six per cent for cargoboats.

Also in the case of *Courageous* if such a reduction of percentage might be possible the displacement would be reduced, *coeteris paribus*, from 18,600 tons to 16,000 tons. This explains and supports the idea, that has been suggested many times by clever men, of greatly reducing auxiliaries, arrangements, furnitures, stores, comforts, etc., on warships with the aid if necessary, of a tender-ship or of a barrack-ship, in order to reduce the weight of "Outfits," of "Equipment" and then the displacement and the first cost of a man-of-war.

13. LIGHTENING OF STRUCTURES

For the *Furious* class (displacement 18,600 tons—21,100 tons, length 736 feet) the hull represents about thirty-six per cent referred to 18,600 tons corresponding to thirty-one and eight-tenths per cent referred to overloaded displacement. It is not known what percentage is absorbed by extraweights of protection and of bulkheads as they concur in strength of ships. By extraweights we mean the excess of weight applied for protection or subdivision over that strictly necessary for strength. It is probable that the extraweights of protection might represent at least five per cent and the extraweights of bulkheads two per cent; then twenty-four and eight-tenths per cent remains for residual and essential structures; this weight is higher than in a cargoboat, but that is justified by difference in length.

In light cruisers the hull with outfits represents fifty-one per cent of normal displacement; the hull without outfits represents about

forty per cent which becomes thirty-four and five-tenths per cent if referred to overloaded displacement; deducing seven per cent for extraweights of protection and three per cent for extraweights of bulkheads, it remains twenty-four and five-tenths per cent as above.

If we start from the percentage of seventeen or nineteen per cent of displacement absorbed by a cargoboat's bare hull, it is necessary to consider the influence of the length. Our ordinary cargoboat is 450 or 400 feet long, while the fast warships, which we are talking about, are 600 or 700 feet long; the increased length required to increase the scantlings of fore-and-aft structures that absorb about two-thirds of the weight of cargoboat's bare hull; some calculations bring the percentage about twenty-three or twenty-four per cent displacement for lengthened hulls, with a convenient depth.

For warships of 10,000–12,000 tons or 6,000–7,200 tons, 700 to 650 feet long, we assume the percentage of twenty-three per cent, that becomes about twenty-eight per cent if referred to the normal displacement of 10,000 tons or of 6,000 tons.

19. BARE HULL SHIPS

With all the above deductions and assumptions we may answer the question on paragraph 3, about the possibilities of 10,000 ton or 6,000 ton warships:

TABLE VIII

Superguns and superspeed instead of armor. "Bare-hull" ships compared with very light protected type.

		BARE-HULL SHIPS (unarmoured and unprotected)		VERY LIGHTLY PROTECTED SHIPS	
		Case K	Case L	Case M	Case N
Normal displacement	tons	10,000	6,000	10 000	6,000
Length of hull	feet	700	700	650	650
Weights					
Hull steel structures (reduced)	tons	2,800	1,680	2,800	1,680
Hull's outfits (reduced)	tons	500	300	500	300
Equipment (reduced)	tons	350	210	350	210
Armour and protection	tons	Nothing	Nothing	1,000	700
Armament	tons	3,200	1,600	3 200	1,600
Machinery	tons	2,800	2,010	1,800	1,310
Oil fuel	tons	350	200	350	200
Normal Displacement	tons	10,000	6,000	10,000	6,000
Horsepower	H.P.	185,000	132,000	120,000	86,000
Speed	knots	40	40	35	35
Supplement of fuel oil	tons	2,000	1,200	2,000	1,200
Overloaded displacement	tons	12,000	7,200	12,000	7,200

Considering the weight allotted to armament in Table VIII, it appears that the 10,000-ton ships may be armed with four 18″ guns in two double gun turrets and that the 6,000 ton ships may be armed with two 18″ guns in one double gun turret, with unarmoured and unprotected gunhouses.

To the objection of a too-heavy armament upon a too-small displacement it may be answered that fifty years ago the Italian battleship *Duilio,* of 12,000 tons, was armed with four very big guns and that recent British monitors, even of 6,000 tons, have been armed with two big guns.

To the objections of the weakness presented at sea by the hull of the *Furious* class near the large well of a gun turret, it may be opposed that this failure was remedied by local reinforcements and it is not impossible to design some peculiar structural arrangement for local and general strength.

But a salient deduction is that the displacement of 10,000 tons and of 6,000 tons imply to use only two or one double gun turret and that shall oblige to develop the target practice of a division of two or four ships and the necessary communications between them in order to control the "Division fire."

15. CONCLUSION. SUMMING UP

1. A further increase of speed for torpedo craft requires to lighten the relative weight per horsepower of machinery. In some cases it is suggested to use totally or partially gasoline motors. Awaiting gas turbines a provisory solution may be to combine light steam machinery for prolonged ordinary service until about thirty knots with gasoline motors to be added for short time extrapower from thirty to forty knots.

2. Transferring on battleships or large cruisers the reliable light steam machinery used on flotilla leaders, the former's displacement may be reduced notably. In this way with the same armament, the same speed of thirty-two knots, the same percentages of hull, outfits, and equipment and about the same characteristics of armours and protection, the displacement may be reduced for *Hood* type from 41,200 tons to 33,100 tons and for *Furious* type from 18,600 tons to 14,000 tons.

3. With the same armament and the same percentages of hull, outfits, equipment, as those of *Courageous* class, but with *neither*

armour nor protection and using light steam machinery it is possible to build a ship of 10,000 tons at thirty-eight knots' speed.

With the same armament, the same percentage of equipment of *Erebus* (monitor) but with *neither armour nor protection* and using light steam machinery with hull of suitable length and strength, it is possible to build a ship of 6,000 tons with thirty-eight knots' speed.

But as long range battle principle requires superguns, it is necessary to reduce other items of weights in order to mount 18″ weapons.

4. The simple reduction of outfits' and equipments' weight to the percentages of cargoboats, accepting the principle of tender-ships attached to warships might reduce notably the displacement.

For instance, the displacement of *Courageous* might be reduced from 18,600 tons to about 16,000 tons without variation either in the types of machinery, armour, and protection, or in the percentage of steel structures of the hull.

5. Combining the lightening of hull and its outfit, of equipment, of steam machinery, and the complete suppression of any armour or protection, we came to what may be called "bare-hull" type of 10,000 tons and of 6,000 tons, at forty knots in each case, and armed with 18″ guns, four or two, respectively, mounted in un-armoured two gun turret.

It may be opposed to this solution another one at thirty-five knots, with the same armament and displacement, but with a very light protection that might be incorporated in the hull, as Sir Philip Watts began to apply in his design of light cruisers (*Arethusa* class), extending the old principle of protective decks.

6. Closing these notes I confirm that I had only the object to examine from the point of view of the French fears, the technical possibilities of the small displacement allowed to Germany. I could not adhere to those fears because I think that actually Germany ought to desire a long period of peace; but, however, I repeat, rather than naval constructions, she would prefer to oppose "German air-power" to "British sea-power."

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HIGHER NAVAL EDUCATION

CAPTAIN J. M. SCAMMELL, INF. R. C.

It is proposed here to set forth a comparison of the purposes, methods, courses of study, and organization of the foremost institutions for higher naval education. The information itself should be of interest, and it is possible that such a comparison may lead to useful deductions.

The sources of information are, where available, the text of the regulations or laws governing the institutions and descriptive articles from naval and general publications.

The wide variation in character is partly due to the fact that in no country does there exist for the Navy the same complete set of schools for professional study as often exist for the Army. The naval war colleges, therefore, must choose from a very wide list of subjects, and the choice and the emphasis often determine the character of the school. Another factor of variation is the national policy toward higher naval education and the number of officers available for detail. The foregoing factors largely determine the methods of instruction and the organization of the college, although the Italian *Scuola Navale di Guerra* is unique and constitutes a law unto itself.

In general the Japanese place the most emphasis upon higher naval education and have the most detailed and varied courses of study. In addition to their specialist schools they have the *Naval Higher College (Imperial Japanese Naval Academy)*, which has a course of two years. The German *Marine Akademie* also had a two-years' course, but all other courses are only one year.

In general this summary may be made regarding the character of these higher schools, that the Japanese and German are real

staff colleges, the French a modified staff college; the British have a separate staff school and a modified war college. The United States, except in technical, *material* subjects, makes no provision for training junior officers, but concentrates all effort upon the training of officers of high rank for higher command.

The aims of the various colleges afford an interesting comparison. The *Service Regulations* of the *Marine Akademie* describes as the object of that institution: "To give naval officers an opportunity to continue their scientific education and thus to fit themselves for higher positions in the naval service."

The Japanese Regulations authorizing the *Naval Higher College* states as the mission of the school:

"The Naval Academy shall give instruction to naval officers and engineers in higher courses in science and art."

The decree reorganizing the *École Supérieure de la Marine* says:

"The object of the school is to instruct the greatest possible number of officers of the Navy in the doctrine of war as deduced from the continuous study of problems of naval war in order to realize in our fleet a complete unity of views of command."

The Regulations of the *Italian Naval War School* states:

"The principal object of the Naval War School shall be to cultivate and fix naval thought upon our preparation for war by the aid of the widest intellectual contribution."

At the *Royal Naval War College* the object of the senior officers' war course is to fit junior captains for commands afloat, although senior commanders, senior captains, and even flag officers occasionally attend.

The *Naval War College* at Newport was established by General Order No. 325 of October 6, 1884, which described the new school as "A college for an advanced course of professional study for naval officers." The Secretary of the Navy at the time, in a letter to the Senate, gave a closer definition:

"The college is intended to complete the curriculum by adding, to an extent never heretofore undertaken, the study of naval warfare and international law and cognate branches."

Since the time of its foundation, the mission of the *United States Naval War College* has been defined with greater precision by its directors and it is to the addresses of its presidents that one must turn to determine its present policy.

Commander Goodrich, in his closing address of September 15, 1897, stated:

"The College distinctly disclaimed the position of teacher and only claimed that of a fellow-student. This stand, I think, was consistently taken and has been as consistently adhered to."

Admiral Sims expressed the purpose thus:

"The primary object of the Naval War College is to study the principles of warefare . . . to develop the practical application of these principles to war on the sea under modern conditions and then to train our minds to a high degree of precision and rapidity of decision in the correct application of these principles."

This policy it is which makes our *Naval War College* as distinct in aim as the Italian is in form and method. Despite the prestige gained by Admiral Mahan and inherited by the War College, despite the early lecture system the institution has resolutely and consistently refused to undertake the rôle of instruction or don the mantle of authority. In his address to the class of June, 1919, Admiral Sims reiterated once more this inflexible tradition in these words:

"The College is in effect part of the fleet and exists solely for the fleet.

"The students bring to the College their practical fleet knowledge and experience. They are asked to consider this practical knowledge and experience in connection with the principles of warfare . . . you will carry these principles back to the fleet."

This policy has repeatedly been, and is at present once more, the subject of discussion.

Therefore, in considering the aims of the various war colleges, we may make the following comparisons: the German, British and Japanese are alike in that they profess to instruct officers for higher command. The American and French resemble each other in their avowed purpose of developing a doctrine of war. The Italian purpose is the exchange of ideas and the study of current naval developments and thought.

It is interesting to observe how variously the different nations go about their tasks. If we keep in mind that nowhere does a complete set of schools exist, the various expedients adopted for covering a very wide field with limited facilities show curious contrasts.

The adjoining table shows in parallel columns the different subjects treated.

GERMANY	JAPAN	FRANCE	GREAT BRITAIN	UNITED STATES
Naval Warfare	Strategy Tactics		Strategy Tactics	Strategy Tactics
Naval History	Naval History	Naval History	Naval History	
				Scouting and Screening
General Staff	Staff Administration Organization Logistics	Staff Foreign Navies French Navy Administration	Staff	Command and Policy Logistics[1]
	Fortification	Coast Defense	Coast Defense	
International Law	International Law	International Law	International Law	International Law
Ordnance Milit. Tactics Hydraulics Hygiene	Ordnance Milit. Tactics Mechanics[2] Hygiene Physics Chemistry	Ordnance Milit. Tactics		
Geography Oceanography Astronomy Navigation Electricity Naval Constr. Polit. Science Engines Submarines Torpedoes	Geography Oceanography Astronomy[2] Navigation Electricity[2] Naval Constr. Polit. Science[2] Engines[2] Submarines[2] Torpedoes[2]	Geography Electricity Naval Constr.[2] Polit. Science Engines Submarines Torpedoes Aeronautics	Electricity Naval Constr	
General History Languages Mathematics Natural History	Languages Mathematics			

[1] Included in Strategy.
[2] More detailed than indicated here.

It will be seen that the German and Japanese are the most comprehensive. Both require two years as against one year for all others. The Japanese is even more complete and detailed than appears in the table where subjects are grouped in order to show parallelism with other schools. These two are practically staff colleges for junior officers. The French school also aims at staff training but is intermediate in type. The British are now conducting a separate staff course for junior officers at the *Royal Naval War College*, while its war course resembles our own except in methods of instruction.

Our own solution, if far from perfect, due to conditions imposed by the policy of the nation, is almost entirely a course for

junior officers given of necessity to senior officers. It has the virtue of a frank recognition that the whole ground cannot be covered in one year and a firm adherence to the subjects regarded as essential. Since the entire commissioned personnel cannot be passed through the school, the War College courageously continues to confine to senior officers a course the large part of which would be appropriate for lieutenant-commanders.

All war colleges study international law, and all, in one form or another and with varying degrees of emphasis, study strategy and tactics. Only in the United States are scouting and screening and command studied as separate subjects, and nowhere else are naval history, naval construction, coast defense, staff duties or electricity neglected.

The method of instruction also at the *United States Naval War College* differs radically from all others. With us alone the lecture plays no part. Such lectures as are given are connected with no course of study and are incidental, except in international law. At Newport we rely entirely upon reading and the applicatory system as expressed in the solution of problems, their maneuver on board and chart, and in the writing of theses. All others, including the British, which most closely resembles our own, depend largely upon lectures.

To a certain extent this explains the composition of the different staffs. The Japanese have thirteen Naval officers and fifteen civilian professors, being in this respect similar to the German *Marine Akademie*. The *École Supérieure de la Marine* has seven Naval officers, two Army officers (for coast defense and aeronautics) and three civilian professors (for Naval history, Naval geography and international law). The British College has a staff of nine Naval officers, one Marine officer, and a number of professors. At our Naval War College we have at present on the staff, as instructors, nine Naval officers, one Marine officer, one Army officer and one civilian professor; three civilian assistants are also provided for and one is now serving.

The Italian *Scuola Navale di Guerra* is described separately because in practically no respect does it afford any basis for comparison with any other. There is no instructional staff; no prescribed course of study, and, although the administrative work is done in the office of the Director, the Chief of the General

Staff at Rome, the meetings are held at no fixed place, but as opportunity offers, whether at a Naval station or on board a ship. Lists of topics for competitive essays are compiled and the best results are read as lectures before the conferences and discussed. Of these lectures and comments the best—except those of a confidential nature—are printed in the *Revista Marittima,* the official organ of the school.

The disadvantages of this organization are self-evident; but there are also very real benefits as the quality of the *Revista Marittima* shows. Not only is a great deal of instruction involved in the preparation of these essays, but the best results are made available for all officers.

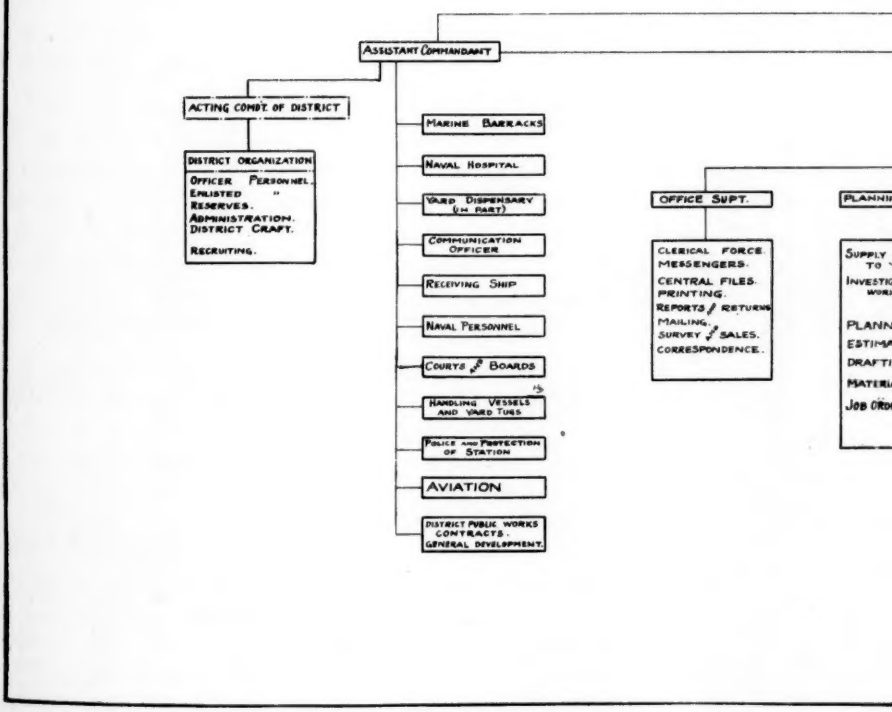
Of the advantages over our *Naval War College* enjoyed by other schools, there are few that can be adopted by us simply because we have not the officer personnel avaliable for either a two-years' course or to permit the establishment of a staff course. What can be done to extend the influence of the War College throughout the fleet is pretty effectually accomplished by the correspondence course and the mailing list of the War College publications. A slight increase in the staff, particularly the development of the indoctrinated civilian force for compiling and editing the fruits of the labors of the students and staff would probably serve to raise the average of information throughout the fleet.

Undoubtedly, with the present critical shortage of commissioned personnel there is no immediate prospect that the approved recommendations of the board of the Bureau of Navigation for a complete and progressive series of schools will be put into effect, and until that is done it is the part of wisdom for the *Naval War College* to reject the allurements of lectures, to decline the luxury of civilian professors and even to continue to disregard the importance of investigations in Naval history as a source for the formulation of doctrine, and to keep firmly to the narrow limits of the present curriculm in order that the vital professional subjects may be covered as thoroughly as possible.

In short the policy of our Naval War College is contingent upon the policy of the country toward Naval personnel, and as long as the country continues to develop its Naval materiel without any rational parallel emphasis upon the quality and quantity of its

personnel, so long will the efficiency of the Navy decrease. Time does not stand still. New developments in warfare continue to exert their influences upon the radio between matériel and personnel on the one hand, and upon the ratio of quantity and quality on the other.

If the developments of science made a War College necessary in 1884, the myriad subsequent developments much more imperatively demand that the many subjects of necessity neglected by that school today be provided for. The country is averse to facing the expense of increasing the quantity of personnel, but it would take only pride and pleasure in any increase in its quality and efficiency. There is a point beyond which any increase in matériel no longer strengthens but weakens a Navy, and the question ought to be discussed whether the fleet would be made less effective or more so if certain ships were scrapped or laid up in order that the recommendations of the Bureau of Navigation may be carried out and the quality of leadership improved.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RECRUITING.
MARINE BARRACKS
NAVAL HOSPITAL
YARD DISPENSARY (IN PART)
COMMUNICATION OFFICER
RECEIVING SHIP
NAVAL PERSONNEL
COURTS & BOARDS
HANDLING VESSELS AND YARD TUGS
POLICE AND PROTECTION OF STATION
AVIATION
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GENERAL DEVELOPMENT.
OFFICE SUPT.
CLERICAL FORCE.
MESSENGERS.
CENTRAL FILES.
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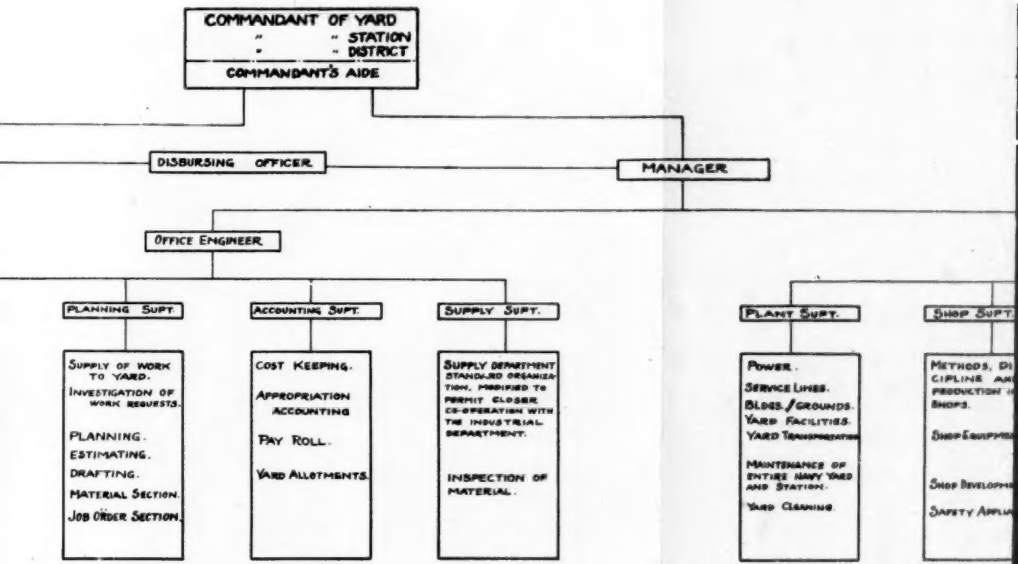
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COMMANDANT'S AIDE
DISBURSING OFFICER
MANAGER
OFFICE ENGINEER
PLANNING SUPT.
ACCOUNTING SUPT.
SUPPLY SUPT.
PLANT SUPT.
SHOP SUPT.
SUPPLY OF WORK TO YARD.
INVESTIGATION OF WORK REQUESTS.
PLANNING.
ESTIMATING.
DRAFTING.
MATERIAL SECTION.
JOB ORDER SECTION.
COST KEEPING.
APPROPRIATION ACCOUNTING
PAY ROLL.
YARD ALLOTMENTS.
SUPPLY DEPARTMENT STANDARD ORGANIZATION, MODIFIED TO PERMIT CLOSER CO-OPERATION WITH THE INDUSTRIAL DEPARTMENT.
INSPECTION OF MATERIAL.
POWER.
SERVICE LINES.
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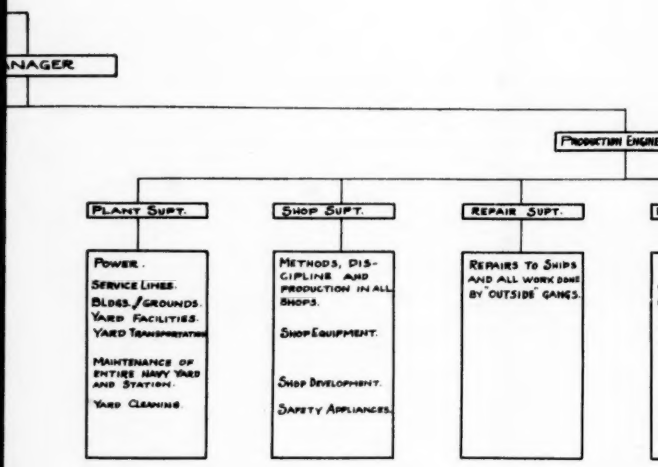
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YARD FACILITIES.
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MAINTENANCE OF ENTIRE NAVY YARD AND STATION.
YARD CLEANING
SHOP SUPT.
METHODS, DISCIPLINE AND PRODUCTION IN ALL SHOPS.
SHOP EQUIPMENT.
SHOP DEVELOPMENT.
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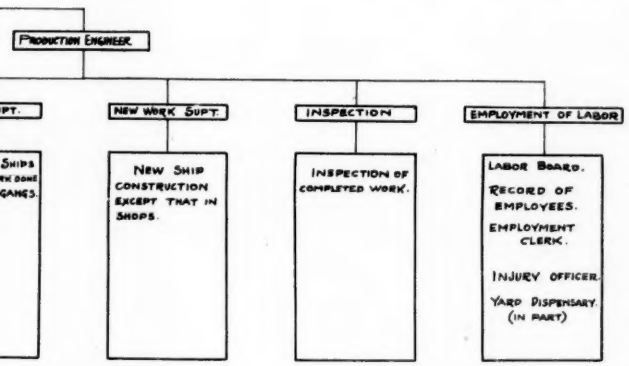

PROPOSED

ORGANIZATION

NAVY YARD, CHARLESTON, S.C.

NOV. 15, 1921.

C.H. Baker

COMMANDER, C.C., U.S.N.

CONSTRUCTION OFFICER.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

INDUSTRIAL ORGANIZATION OF NAVY YARDS

By Commander C. W. Fisher (CC), U. S. N.

1. On November 28, 1921, a conference of commandants and managers will take place at the Navy Department, Washington, D. C., for the purpose of discussing, and if possible, of establishing a standard organization for navy yards.

2. This conference is the result of two General Orders issued by the Navy Department, one of which established an office in the department under the Assistant Secretary of the Navy, for controlling the general administration of navy yards, while the other set forth the general principles upon which the organization of the navy yards themselves should be based. The following notes while they do not strictly conform to the requirements of these orders are nevertheless based upon the principles enunciated in them, which principles, to my mind, afford a sound logical basis for obtaining much better results than have been possible in the past.

3. For convenience the two General Orders referred to are quoted in part below.

GENERAL ORDER No. 68 September 6, 1921.

Department Administration of Navy Yards and Naval Stations

The departmental administration of navy yards and naval stations will be conducted under the immediate supervision of the Assistant Secretary of the Navy.

Specifically, the following activities are included within the purview of this order, and all conflicting regulations shall be changed accordingly:

(a) Administration, organization and management.
(b) Civilian personnel and labor, and all matters pertaining thereto, including the maintenance of high morale.
(c) Recommendations for complements of officers.

Note: This article was written in November, 1921.

(d) Buildings, grounds, shops, power plants, service lines and rolling stock.

(e) Plants, machine tools, equipment, and appliances.

(f) Manufacturers and manufacturing processes.

(g) Cost analysis in connection with the determination of economy and efficiency.

(h) Co-ordinating the assignment of available funds, co-ordinating the assignment of work on vessels made available for work at yards and stations by the Chief of Naval Operations, and co-ordinating other work assigned to yards and stations in accordance with their abilities, with a view of maintaining stable labor conditions, consistent with the military needs of the fleet.

(i) Inspections of navy yards and naval stations.

(j) Co-ordinating the above activities and functions with the war plans and fleet operating schedules.

(3) The actual assignment to yards of vessels; the availability of vessels for repairs; the priority of work on vessels; the designs and details of work, repairs, and alterations; and the allotment of funds, will be determined as heretofore by the bureaus and offices responsible therefor under law and regulations.

GENERAL ORDER No. 53 June 16, 1921.

ORGANIZATION AND ADMINISTRATION OF NAVY YARDS AND NAVAL STATIONS

(1) Navy yards and stations exist for the service of the fleet, and chiefly for those services to vessels, of repair, docking, revictualing, and improvement, that are beyond the capacity of the ship's force to accomplish.

(2) The officer ordered to command a navy yard or station is the commandant. He is the representative of the Navy Department in all matters within the limits of his command, and is responsible to the department for all business transacted therein. As commanding officer he shall exercise entire control over every part of the yard or station, and shall have full authority over all persons, civil and naval, employed therein or attached thereto.

(3) The commandant shall execute the department's policies issued to him from time to time so far as they apply to his command, together with such orders and instructions as he may receive from proper authorities.

(4) It is the duty of the commandant—

(a) To base his plans, methods, decisions, and recommendations upon such approved plans for national defense as may be furnished him from time to time by the department.

(b) To accomplish the maximum service to the fleet.

(c) To lead the men of his command, whether civil or naval, through sympathetic consideration of their aims and of their needs.

(d) To establish, to maintain, and to enhance, by every practicable means, the spirit of his subordinates, civil as well as naval.

(e) To restrict expenditures to the limitations of funds made available for expenditure within his command.

(f) To secure the performance of work in accordance with priority established by the department.

(g) To prevent and to avoid waste, whether of funds, of time, or of facilities.

(h) To simplify the organization and methods of administration by concentration of shops, drafting rooms, storehouses, and other facilities to the end that as large a proportion as possible of the total navy yard expenditures shall be devoted to productive labor on approved projects.

(i) To co-operate in every way possible with the Navy Department and with the commanding officers of the vessels at the yard.

(j) To co-ordinate the work of the various yard activities, to require the faithful and efficient performance of duty by all persons employed within his command, and to enforce within his command the strict observance of law and of regulations.

(k) To exercise a proper supervision over all matters affecting general health, safety, and welfare.

(l) To make recommendations to the Secretary of the Navy in regard to development of the yard or station.

(m) To keep the department informed as to the progress of work and the general condition of the command.

(n) To give the department the benefit of his experience and judgment to assist it in formulating its policies.

(5) It is the intention of these regulations that the commandant, as the representative of the department, shall, in the exercise of his duties and in accordance with the department's policies and instructions, make decisions to relieve the department of detail and to reduce correspondence. The administration of navy yards and stations is directly under the commandants. The bureaus of the department have no cognizance over this administration, but the commandants are responsible for the faithful execution of the bureaus' orders.

(6) The commandant has power to administer punishment in accordance with the regulations of the navy and of the civil service, upon any person under his command, who commits any crime or misdemeanor or whose conduct otherwise warrants it.

(7) In the absence of the commandant the senior officer present, eligible by law to exercise command ashore, shall assume command of the station.

(8) The internal organization of any navy yard shall be based upon the service that yard is expected to render to the fleet in time of war. The relation between the usual peace-time conditions and those that may be met successfully in time of emergency as well as peculiar local conditions, such as facilities available and character of work and of personnel, should

determine all decisions made by the commandant in framing the organization of the yard and in modifying the duties charged to any one of his subordinates beyond those hereinafter set forth, which are prescribed as the standard practice for navy yards. The commandant should arrange the internal organization of his command so that ordinary, usual, and smoothly running affairs of the command be not referred to him; to the end that the overcoming of difficulties, adjustment of differences of opinion between subordinates, and troubles, together with the needs and methods of their yards in a large way, shall furnish practically the entire demand upon the time of the commandant.

(9) The principal aids to the commandant are the captain of the yard, whose duties are set forth in Navy Regulations, and the manager, who shall be an officer of experience and demonstrated capacity in the direction of industrial activities.

(10) The commandant shall place the industrial activities of the yard, including the labor force, all facilities for productive shops and offices, the supervision of personnel and facilities of the Industrial, Public Works, and Accounting Departments in the hands of an experienced officer, who shall be called the manager. Unless some officer is specifically detailed for duty as manager, by orders of the Navy Department, the commandant shall select one from his subordinates and assign him to this duty.

(11) The duties of the manager are as follows:

(a) To support the policy and to execute the orders of the commandant.

(b) To assist the commandant in all ways practicable in the execution of his duties as herein set forth.

(c) To co-ordinate and be responsible to the commandant for the activities placed directly under his charge.

(d) To pass upon requests for work from ships and to decide such requests in accordance with general instructions from the commandant.

4. Before attempting to outline a navy yard organization based upon the principles laid down in General Order No. 53, it is well to consider the underlying purpose of this order and the limitations involved in the fact that the organization must be a naval organization, and therefore semi-military in character, officered by men who have had military training rather than industrial training. If the object of General Order No. 53 is really to establish and maintain an economical, businesslike, and efficient organization for navy yards (which is sorely needed, especially at this time of reduced appropriations) several difficult, if not unpleasant, facts and conditions must be faced, before a definite scheme is to be put into being. Among these are the following:

(a) Navy yards can never hope to obtain maximum efficiency, due to the fact that naval officers are not ordinarily ordered to navy yards because they have proved themselves to be specially fitted for navy yard work. This of course, applies more particularly to the junior officers and those of the line and sea-going corps. Furthermore, the necessity of sending officers to sea after a short tour of duty of two or three years at navy yards has a very detrimental effect upon that continuity of policy which has such an important bearing upon success in any administrative or executive work.

For the so-called industrial portion of navy yard work, very few naval officers have any special aptitude. Still fewer are those who could compete with commercial men whose principal training has been along lines of industrial management. Navy yard work, and especially industrial work in navy yards is (except for a few officers in the non-seagoing corps) a side issue in their life work of training for combat at sea. Control of a civilian personnel requires to a certain extent at least, different personal characteristics and habits of thought from control of a military enlisted personnel.

(b) Increased efficiency, for which we are all striving, means doing *more for the same money*, or to put it in another way (particularly applicable to present conditions) doing nearly as much for half the money. Considering labor alone, to the exclusion of material, it means that at least the same amount of work as is now being performed must be accomplished by fewer men, both officers and civilians. If no reduction in officer and civilian personnel is made at navy yards, then there is no increase in efficiency so far as labor is concerned, unless a greater output is obtained. It is therefore apparent that if a reorganization is to be effective and the same amount of work is to be handled there will inevitably result a reduction in the number of officers on duty at navy yards. Self-deception in this regard has been the rule in the past in connection with previous attempts at navy yard reorganization. Giving an officer or an employee another job in the navy yard

does not reduce the cost of running the yard no matter what the accounting system may say.

(c) Excessive paternalism in the matter of leave, holidays, retirement, pensions, etc., has a marked effect in increasing the total cost of work in navy yards. It is proper that the Government should lead the way in improving the condition of the worker, but there is no reason why the Government need be so far in advance of general conditions as to place unwarranted burdens upon the tax payer.

(d) Political, departmental, and Civil Service interference with the choosing of employees, their retention, re-rating and discharge, operates directly to undermine the commandant's and manager's authority and prestige, and hence their control of the working force. Few if any yards with which I am acquainted do not feel hampered from one or all of these three causes. During the past fifteen years the Civil Service rules have become increasingly restrictive, and have consistently withdrawn control of the employment of labor from the commandant and placed it in the hands of the Civil Service Commission. Red tape is correspondingly increased. Yet after fifteen years' service in navy yards I fail to see that the employee, collectively or individually, has benefitted in the least. Commandants or heads of departments feel hampered by the Civil Service rules, and the mere fact that they *feel* hampered (whether they are *actually* hampered or not) prevents that prompt reward for well doing and equally prompt discipline for ill doing that forms the backbone of an efficient organization.

(e) Unequal authority granted to commandants tends to produce useless paper work and interferes with the efficient conduct of navy yards. A commandant may employ fifty additional mechanics at $5.00 a day, but he may not employ a single additional clerk at $3.28 a day without authority from Washington. A commandant may undertake a repair job on a ship amounting to $3,000, but he is forbidden to promote a draftsman to a forty-eight-cent increase without authority from Washington. A commandant may send a tug to carry an officer on duty to a point 100 miles away, at a cost of several hundred dollars,

but he may not issue orders so that the officer could travel by railroad at a cost of $5.00, without having such orders approved by the Bureau of Navigation. Some of these conditions, of which only a few have been referred to, are due to restrictive laws, which should be repealed; others are the outgrowth of custom. In any event, to obtain maximum efficiency the commandant should be given the authority which is contemplated in General Order No. 53 in *all* matters under his control, and he should be held responsible for results instead of being restricted in authority.

(f) A further difficulty in working out a logical organization is that of the military questions of relative rank and precedence and its side issues, such as the right to occupancy of navy yard quarters. These questions should have no part in determining the most efficient type of navy yard organization; but they do nevertheless exert a most powerful influence. In fact, a glance at the recent charts of the organization of the various navy yards will show that great consideration has been given to such matters.

5. I have discussed above some of the conditions that form obstacles to establishing a thoroughly efficient navy yard organization. Summarizing, these are:

(a) Naval officers are not trained industrial administrators or executives and are not available for long tours of duty.
(b) Difficulty in reducing the number of officers on shore duty.
(c) Excessive gratuities to employees.
(d) Outside interference with employment of labor.
(e) Authority commensurate with responsibility not granted to commandants.
(f) Some difficulties due to rank.

Some of these conditions can be remedied; others cannot be remedied. They, and others similar to them may perhaps be covered by the general statement that the maximum financial and industrial efficiency can never be obtained in any navy organization because it must be run by a governmental military organization,—the navy. However, by

analyzing and facing such conditions, ways may be found to improve them and they should be constantly kept in mind with that end in view.

6. Titles of Officials

(a) The consolidation or amalgamation of the present working departments and divisions of the navy yards is essential to efficiency, and as a very important aid to accomplishing such complete amalgamation I strongly advocate doing away completely with the present titles of Head of Department or Head of Division. Such titles perpetuate the old navy yard organization whereby each bureau of the Navy Department had its representative at the navy yard, each having under his control a more or less complete small industrial plant. The wasteful duplication of effort, and the duplication of similar facilities and shops involved in this scheme led, about fourteen years ago, to the first steps towards its abandonment, namely, the abolition of the Equipment Department at navy yards, and the abolition of the Bureau of Equipment in the Navy Department. This was followed by the abolition of the Ordnance Department at navy yards and the establishment of the Hull Division and the Machinery Division for performing all ship work. In an effort to avoid the complications which resulted from the fact that the Navy Department was organized into bureaus—while the navy yards were then organized partly into divisions whose duties brought them into relation with more than one bureau—the Navy Regulations were changed to provide that the commandant is the only representative of the bureaus in a navy yard. How this has actually worked is familiar to all. The bureau representatives still exist *de facto* if not *de jure*. The *construction* officer represents the Bureau of *Construction* and Repair, the *engineer* officer represents the Bureau of *Engineering*, the *supply* officer represents the Bureau of *Supplies* and Accounts (note the similarity of names), and the public works officer represents the Bureau of Yards and Docks. Ask any one how difficult it is, even after the lapse of many years, to

train a clerk that a C. and R. item of work on piping has nothing to do with the construction officer.

(b) To attain the thorough and complete amalgamation of like duties, which is necessary in any efficient organization, the psychological effect of such apparent trifles cannot be ignored, the more so because they have helped to bar the way to progress during past years.

(c) The selection of titles so that they may be simple, descriptive and at the same time avoid the above difficulties is not easy. The following suggestions are offered:

Commandant: Retain this title for the official in full military command of the navy yard, station and district.

Department: One of the two groups into which all of the commandant's activities are divided, as indicated in General Order No.53. There will be only two departments, namely, military and industrial.

Assistant Commandant (Captain of the Yard): The title of the official who administers the Military Department. This title is recommended to take the place of captain of the yard, which is too restrictive for the enlarged duties vested in this official.

General Manager: The title of the official who administers the Industrial Department.

Division: One of the two groups into which the Industrial Department (under the general manager) is divided. These two groups are the Office Division and the Production Division.

Office Manager (Or Office Engineer): The official charged with the administration of the Office Division.

Production Manager (Or Production Engineer): The official charged with the administration of the Production Division.

Section: One of the several groups under the office engineer and the production engineer, such as Planning Section, Ship Repair Section, etc.

Superintendent: The official in charge of a section, as planning superintendent, shop superintendent, etc.

7. To carry out the ideas expressed in the preceding paragraph, all officers should be simply ordered to report to the commandant "for duty," instead of being ordered, as at present, for duty "as engineer officer" and the like.

COMMANDANT'S FUNCTIONS

(a) The commandant of the navy yard is also the commandant of the station and the commandant of the district. In combining these three functions in one individual the duties imposed thereby may be divided into two broad groups which for lack of better terms may be called Military and Industrial. In some instances it is not easy to determine whether a given activity is primarily industrial or military, and in deciding this point three criteria have been used:

(1) If the industrial portion of the yard were discontinued and the activity in question was still considered necessary as a military requirement, the activity has been classed as military.

(2) The Industrial Department, that is, the activities grouped under the manager, has been considered as the *producer*, and any activity which under ordinary conditions would be primarily the *customer* of such producing department, rather than a unit of production itself, has been classed as military.

(3) The manager should have as nearly as possible the same authority, power, and responsibility as are ordinarily vested in the general manager of a large commercial shipbuilding plant.

(b) On the above basis the military activities under the commandant of the yard, station and district, of which the assistant commandant should be the executive and the direct representative of the commandant, are the following:

Courts and Boards,
Handling vessels in commission at the yard,
Dispensary and yard surgeon (in part),
Chaplain, yard recreation center,
Enlisted personnel officer; welfare work,
Policing and protection of yard and station,

Marine Barracks,
Communication Office,
Aviation,
Receiving Ship,
Administration of district affairs and district public works,
Naval Hospital,
Recruiting, etc.

(c) On the same basis the following activities should be assigned to the manager as comprising the industrial portion of the commandant's functions:

Purchase, receipt and issuing of all stores and material,
Operation of all shops and productive units,
Maintenance and repair of all the industrial department plant and equipment,
Yard transportation,
Industrial accounting,
Employment of labor,
Inspection of work.

Note—Dependent upon the size of the yard and the volume of district work, it may be necessary to have a separate officer perform the function of assistant commandant and another to handle district matters. This arrangement, however, does not affect the principle of the organization herein outlined.

(d) The above outline means that the manager should control the Hull Division, Machinery Division, Supply Department, Accounting Office, employment of labor, and Public Works Department (except for district and contract work and general schemes for yard and district development).

(e) The assistant commandant should control all other matters under the cognizance of the commandant.

OFFICE ORGANIZATION

(f) Before taking up in detail the organization of the two executive branches referred to above, it is well to outline briefly the principles which should obtain in the office of the commandant, assistant commandant, and manager, as regards handling correspondence, etc. The consolidation of files and correspondence is

highly desirable, but this consolidation should be so arranged that there should be no difficulty in separating the correspondence concerning individual activities in case the yard grows to such an extent as to render necessary an expansion involving the splitting off of such activity from the main stem of the organization. This simply means that the indexing and filing system should be intelligently worked out.

(g) *The Commandant's Office,* supervised by a chief clerk (who should be the commandant's confidential clerk and secretary), should exercise the function of a clearing house. All incoming correspondence should be opened here and given its primary routing to the assistant commandant or manager. This office should not attempt detailed routing or detail instructions regarding the handling of correspondence except in unusual and special cases which warrant such action.

(h) This office should also receive and arrange all outgoing mail which requires the commandant's signature. Beyond one assistant to the chief clerk and perhaps one stenographer for special work, there should be no special office force assigned to this office, but any additional clerical work required should be obtained from the central office.

(i) *Assistant Commandant's Office:* The assistant commandant should have a supervisory clerk or, if the volume and importance of work requires it a chief clerk to handle correspondence and act as secretary to the assistant commandant. After mail is received from the commandant's office it should be indexed, given the detail routing necessary, the required number of copies prepared, and the papers sent on their way.

(j) *Manager's Office:* A chief clerk with suitable assistants should perform relatively the same duties as outlined above for the assistant commandant.

(k) If at all practicable, it is strongly recommended that these three clerks be *not* placed in the same room as their duties are in no way connected.

(l) The central files and correspondence office should be supervised by either the chief clerk to the commandant, or preferably, the chief clerk of the Industrial Department. In this office should be concentrated all typists, and stenographers, and the office should furnish such clerical assistance as is needed by

the commandant, assistant commandant, and the manager. As the yard grows, it will be necessary to separate the industrial files from the military files and establish corresponding separate office forces.

ASSISTANT COMMANDANT

(m) No discussion is here given of the detail organization of this branch beyond emphasizing the evident desirability of concentrating in one office and in the hands of a direct representative of the commandant, all of the now dissociated and independent activities, which the commandant is called upon to administer. Such concentration will provide a method and an office through which such matters as are now handled by the commandant, may pass, and be acted upon expeditiously, even in the absence of the commandant, by an officer who is by virtue of his position, thoroughly familiar with the policy of the commandant and is authorized by him to act in accordance with that policy. Such concentration is by no means meant to restrict the present custom of direct correspondence with the Navy Department and its bureaus on the part of certain activities (for example, Naval Hospital), but will place in one office general matters of administration in such a way that conflict of policies will be avoided and possibility of economies will be increased.

MANAGER

(n) There are many types of industrial organizations, each particularly suited to its own class of work. All organizations depend to a certain extent upon personality. With the constantly changing personnel of navy yards such dependence on personality must be reduced to a minimum or else the organization must be constantly changed to suit the new officers. It must be further realized that generally speaking there will be found on duty at navy yards comparatively few officers who are keenly interested in industrial work or who have any special talent for it. At a small yard it is necessary to establish an organization such that the absence of one or more of the principal industrial officers will not tend to break up the smooth running of the department. At the same time the organization should be capable of being expanded to cover the needs of the yard in war time and

to accommodate normal growth and expansion. For these reasons the manager's functions are divided into two main divisions, the Office Division and the Production Division.

OFFICE DIVISION

(o) This includes all correspondence, work requests, purchase, custody and issue of supplies and material, preparation of work, planning, estimating, drafting, issuing job orders, inspection of material, and the reports incident to the prosecution and completion of work.

PRODUCTION DIVISION

(p) This comprises the operation of the shops and outside work forces, new construction, ship repairs, maintenance of plant, furnishing power, and in general, the actual productive work required to transform the plans of the office into a completed job. Outside work includes all matters pertaining to employment of labor, except those relating to the office force itself. (The clerical work of the employment office may be placed under the inside superintendent.)

DISBURSING OFFICE

(q) The manager also should have certain authority in connection with the Disbursing Office of the yard, that is, so far as regards the paying off of civilian employees. Aside from this, however, the disbursing officer of the yard should come under the control of the assistant commandant.

(r) The manager thus, like the commandant, has two principal assistants or executives, namely, office engineer and production engineer.

OFFICE ENGINEER

(s) The office engineer should handle the following groups or sections:

Correspondence,
Accounting,
Material and supply,
Planning and estimating,
Material inspection,
Surveys.

(t) The above outline of the functions of the office engineer includes the present Supply Department. The supply officers' organization should remain intact except that much more intimate relations should be established between it and the Industrial Department of which it should be an integral part, and consolidation and reduction of offices should be made where possible. It is especially necessary that information regarding purchase, receipt and the presence in store of all items of material used by the Industrial Department should be available for use by the Industrial Department without the lost motion that at present exists.

(u) Each of the sections assigned to the office engineer need not be supervised by a commissioned officer. The number of such officers required will depend upon the volume of work and size of yard.

PRODUCTION ENGINEER

(v) The production engineer should control the following groups and sections:

Plant, including all structures, machinery and facilities necessary for the operation of the Industrial Department,
Administraton of shops,
Ship repair work,
Shipbuilding work,
Yard transportation,
Inspection of finished jobs; and handling and discipline of all civil employees, except those of the office force.

(w) The various sections assigned to the production engineer need not be each supervised by a commissioned officer,—this, as in the case of the inside superintendent, depends upon the size of the yard and the volume of work.

PUBLIC WORKS

(aa) It will be noted that the functions of the present Public Works Department have been split, those pertaining to the district outside of the yard, contract work, and general development, being assigned to the assistant commandant, while those which have to do with the repair, maintenance, and operation of the Industrial Department are vested in the manager. This means the absorption of the present Department of Public Works, and

the merging of the present public works office force with those of the assistant commandant and the manager, the merging of the public works drafting force with that of the Industrial Department, and the absorption in the shops under the production engineer of the laborers and mechanics now carried on the public works rolls.

SUPPLY DEPARTMENT

(bb) The Supply Department as well as the Public Works Department has been, in the above organization, absorbed by the Industrial Department. This does not involve the necessity for breaking up the standard organization for Supply Departments at navy yards recently issued by the Bureau of Supplies and Accounts, but may involve slight modifications of this organization in order that the best interests of the yard and station may be conserved. It has been frequently claimed that issues of material direct to ships, which do not involve any of the shops of the Industrial Department, make it desirable that the Supply Department be independent of the manager. Such an argument in my opinion is fallacious, and I am convinced that the best results can be obtained by having the manager responsible for supplying *all* needs of the fleet except those strictly military matters such as, enlisted and officer personnel, etc. Although the money value of stores issued on ships' requisitions frequently exceeds that of stores issued to the Industrial Department, nevertheless the purchase and issue of material used by the Industrial Department usually requires more care and attention than the larger volume of issues direct to the ships. That the manager should control the purchase, storing and issuing of material used in his own shops is a principle so firmly established in the commercial world as to need no argument here.

HULL AND MACHINERY DIVISIONS

(cc) It is evident that the proposed organization completely does away with any distinctions as between Hull and Machinery, and combines the two divisions into a single working unit. The retention of the divisional ideas and names, and the older ideas of bureau cognizance affecting yard work have been for years prolific causes of inefficiency and contention. They tend to permit

the building up in navy yards of small independent units of activity, each attempting to obtain as much power, prestige and authority as possible. Such conditions actually exist in nearly every yard with which I am familiar, and are largely responsible for failure to obtain the economies that are easily attainable by consolidation of shops and offices and the abolition at navy yards of bureau and division lines. It should be firmly fixed in the minds of all officers and employees at navy yards that the only bureau representative at the navy yard is the commandant, and that so far as they are concerned any legitimate order to do work is an order of the Navy Department itself, and not any one particular bureau or branch of the Navy Department. This result can be aided by reducing the number of different appropriations.

THE DUTIES OF THE CAPTAIN OF THE YARD WITH SPECIAL REFERENCE TO HIS RELATIONS WITH THE MANAGER'S DEPARTMENT, THE SUPPLY DEPARTMENT AND OTHER DEPARTMENTS OF THE YARD

(1) Reference to the organization chart shows plainly the relative position occupied by the captain of the yard (assistant commandant). He is the head of the Military Department, and should be of such rank as to succeed to command of the station in the absence of the commandant.

(2) The other "departments" of the yard are, as shown on the chart, assigned to either the captain of the yard or the manager, or split between them, as in the case of the yard surgeon and the disbursing officer. (Note that the proposed organization does away completely with the existing yard departments.) While the captain of the yard succeeds to command of the station in the absence of the commandant, yet when the commandant is present, his authority should be strictly confined to those activities assigned to him as shown on the chart organization.

THE DUTIES AND STATUS OF THE PUBLIC WORKS OFFICER, AND THE ASSIGNMENT OF YARDS AND DOCKS WORK AND ACTIVITIES

(1) Reference to the chart of organization will show that there is no public works officer of the yard. The work and activities of

the present Yards and Docks Department have been split up and assigned to the proper functional group of the organization; the drafting force to the consolidated drafting room under the planning superintendent; the clerical force to the office force of the office engineer; the outside working force to the proper group under the production engineer, etc.

(2) All contract work; dealings with outside contractors; the study of the yard and district development; the construction and extension of public works in and out of the yard; and similar broad questions should be handled by the district public works officer under the assistant commandant.

(3) Generally speaking, the plant superintendent could well be a civil engineer (though this is not essential). The plant superintendent, however, if not a civil engineer should have at least one assistant who is a civil engineer. If the amount of work and the size of the yard warrant it there should also be a civil engineer as an assistant to the office engineer.

(4) The underlying principle in the disposition of Yards and Docks work should be the same as that of C. and R. work and Engineering work, namely, its assignment to the proper functional group rather than the perpetuation or creation of work groups according to appropriations or bureaus.

THE STATUS OF THE DISBURSING OFFICE

(1) The disbursing officer is personally responsible for considerable sums of money; his responsibility is direct to the Bureau of Supplies and Accounts. It is considered unwise to disturb the present arrangement regarding the actual handling of money. For this reason the disbursing officer should come under both the assistant commandant and the manager. He should be responsible to the assistant commandant for all matters pertaining to pay and allowances of officers and enlisted men, and should be responsible to the manager for all matters pertaining to the pay of civil employees, and such items as handling special deposits for work done for outside parties, etc.

METHODS OF INSPECTION OF WORK AND THE NECESSITY FOR A SEPARATE INSPECTION DEPARTMENT

(1) No separate inspection department is considered advisable or necessary. The present method of having ships' officers inspect

work on ships is an economical and satisfactory method of handling this phase of inspection work. The inspection of other classes of *work* (as distinguished from *material*) done in the navy yard should be by the person or official for whom the work is performed, and an inspection notice of the same general character as that used by ships should be employed for such work. For example, work done for a lighthouse tender should be certified as being satisfactory by the commanding officer of the tender just as though she were a naval vessel; repairs to a steam hammer in the smithshop should be certified to by the shop superintendent; repairs to motor trucks should be certified to by the plant superintendent, etc.

(2) It is considered that the foregoing method will be most economical and at the same time safeguard the interests of the customer and of the yard.

(3) Aside from the inspection of *work* there is the inspection of material in various forms. Such inspections can best be grouped in one section or office and should include such items as the following:

Purchased material generally,
Food, lumber,
Survey of equipage afloat,
Survey of items ashore,
Inspection of yard craft,
Inspection of boilers, etc.

The above items, and others similar to them, should be grouped under the office engineer. He should be allowed a sufficient number of officers capable of carrying on this work. In large yards where conditions warrant it these inspectors should be supplemented by the necessary clerks, chemists, laboratorians, physical laboratory, chemical laboratory, food testing laboratory, etc. The holding of surveys on equipage is practically nothing more than an inspection and the same personnel can well be used for this purpose as is used for the other inspections because the same requirements exist as to knowledge of the classes of material used in the Navy both afloat and ashore.

(4) It is distinctly not recommended that a large inspection force be built up at once. The existing facilities and personnel for carrying on this work should be gradually combined

under the office engineer with as little expense as possible. It will ultimately be found that the number of officers and other persons engaged in this work can be greatly reduced by such consolidation.

THE SIGNING OF MAIL AND APPROVAL OF PLANS TOGETHER WITH THE REDUCTION, SIMPLIFICATION AND EXPEDITION OF CORRESPONDENCE

(1) The commandant should confine his activities to controlling the general policy of the yard as a whole, co-ordinating the military and industrial requirements, and carrying out the Navy Department's policy as regards navy yards. Mail to be signed by the commandant should be confined to letters directly bearing upon such matters; letters of detail should not require the commandant's signature unless they are "exceptions," that is, of such nature as to be outside of the ordinary run and which require separate and unusual action.

(2) The manager should sign all important mail from the yard to the Navy Department or any of the bureaus. This should not include routine mail of any nature.

(3) The office engineer should sign all routine reports of every nature. The Planning Superintendent or the head of the material section should sign all letters of inquiry, which are not *orders,* to outside commercial firms. (This is intended to cover such items as requests for quotations, time of delivery, catalogues, etc.) The manager should sign all internal memoranda or orders which deal with the Industrial Department of the yard only, and which do not conflict with or modify any existing yard regulations.

THE PLANNING SYSTEM REQUIRED AND THE SIZE AND COMPOSITION OF THE PLANNING FORCE

(1) The answer to this question depends largely upon what the planning system is supposed to accomplish, and what the planning superintendent's duties should be. To obtain the best results, the Planning Section should be the nerve center of the industrial organization; to it should come from all sources information and requests or orders for work. The Planning

Section should digest this information and should transform this data into definite and specific job orders or instructions for executing work. The routine clerical work of the Planning Section should be performed by the correspondence section, but the planning superintendent should be in a position to control the order and methods of performing such clerical work.

(2) This means that the Planning Section should receive (through the office superintendent) practically all incoming mail; should control the combined drafting room; should have a competent and sufficient force of planners and estimators; should have an ample material section; and should have sufficient personnel of suitable ratings to prepare and issue its instructions.

(3) The extent to which the planning of jobs should be carried has been the subject of much discussion. The best results can be obtained by having such planning go as far as the shop door,—the detail shop planning to be performed by the foreman assisted by the shop superintendent. The custom of issuing orders, as fast as written, to foreman for execution, more or less when they see fit, is not productive of the greatest efficiency. Job orders when planned, with all auxiliaries, should be sent to the production superintendent's office, and a detail dispatching system should be established, so that the control and distribution of the working force can remain in the hands of the Production Superintendent. No orders to do work should be issued to the masters until the work is ready to be performed and all material is available. Such a dispatching system at first appears complicated and expensive but the results to be obtained from it more than justify its establishment not only from the point of view of controlling the order of work, but in actual reduction in the cost of work.

(4) It is difficult, if not impossible, to measure in dollars and cents the efficiency or value of any planning system. Experience has, nevertheless, shown that wherever planning has been established, reductions in costs have always followed, even though the so-called overhead expense rate has been raised. It would be a grave mistake to limit in any way the size and composition of the planning force. This should be controlled absolutely by the planning superintendent, and he should be held

responsible together with the production engineer for keeping costs down. The present restriction in the actual numbers of the planners and estimators is a great mistake and can only result in increasing yard costs.

THE SHOP SUPERVISORY FORCE

(1) Upon the shop supervisors (the leadingmen and quartermen) rests the ultimate possibility of turning out more work for less money. To produce this result such men must be well paid and be chosen with the utmost care. The present Civil Service Regulations which make the position of leadingmen absolutely dependent upon the number of employees, and hence upon the volume of work at the yard, exercise a very detrimental effect upon these men. Sixteen years of navy yard experience have shown that very few of such supervisors care to exercise their authority to the full extent, with the possibility always facing them of being reduced to mechanic and being forced to work by the side of the men whom he has previously "bossed." Navy yard supervisors are inadequately paid. It is much cheaper for the Government to employ high grade and highly paid foremen, quartermen and leadingmen, through whom the output of the working force can be increased, than to attempt to retain mediocre men at lower salaries to control the force of mechanics. Every gang of men works better under a good boss, a firm boss, a capable boss, and such men cannot be obtained unless they are adequately paid and assured that they will retain their positions as long as they make good.

THE DRAFTING FORCE. SIZE AND DISTRIBUTION IN GRADES

(1) The same remarks apply regarding the drafting force as were made in connection with the planning force. The number of draftsmen and their distribution in grades should be left to the yard. The Navy Department, if it attempts to limit the number of draftsmen and their distribution in grades, is thereby attempting to control details with which it cannot be familiar. The drafting requirements vary from month to month, and the commandant and the manager are better fitted

to judge of the drafting needs than any organization at a distance from the yard. The old scheme of making a cast iron rule as to the number of clerks, number of estimators, and the number of draftsmen, reduces the authority of the yard officials while holding them to full responsibility. This method violates one of the fundamental principles of good management which is that responsibility should always be accompanied by authority. The manager is permitted to increase or decrease his force of mechanics, helpers and laborers to suit the needs of the work. There is no valid reason why he should not be permitted to vary his clerks, draftsmen, planners, and estimators to suit the volume of their work.

SUGGESTIONS TOWARDS SIMPLIFICATION OR BETTERMENT OF COST ACCOUNTING METHODS AND RETURNS

(1) The cost accounting system at navy yards as at present established, is for accomplishing two purposes:

(a) Recording and controlling expenditures under the various naval appropriations.

(b) Determining and recording the cost of work performed in navy yards.

Since the cost of all work done at navy yards is defrayed from naval appropriations, there is necessarily a connection between these two functions. The connection, however, if the quickest and most efficient results are to be obtained, should be made as slight as possible. It is always necessary for the executive officers at navy yards to so arrange the work that the monthly allotment of funds, or in the case of certain public works appropriations, the total appropriation, shall not be exceeded. When the monthly allotments are small this requires close and unremitting attention on the part of heads of divisions and others concerned. Such control of daily expenditures, involving as it does the following—discharges, all employment of labor, as well as the decision as to what items of repairs and alterations can be undertaken—is made doubly difficult by the fact that accurate and prompt reports in usable form are not obtainable from the Accounting Office. The daily appropriation expenditure sheet is always several days late, and furthermore, does not contain

information in such form as to enable the head of department to increase or reduce his labor and material expenditures without making several calculations and allowances. The principal difficulty in this regard is naturally overhead, and the principal item in the overhead is power. Accurate expenditure figures for power, and consequently the total overhead, are not available until the end of the month, so that an estimated allowance based on past experience must be made for this item.

(2) It is well known that the so-called "actual costs" of power and similar distributed items of overhead, consist in part at least of estimates (for example—all power is not metered and some classes of power cannot be metered at all). This being the case, it seems perfectly feasible to make the estimate in the first place to cover the power charge to be allocated to any particular appropriation, instead of making the estimates in detail as to shops and buildings, as is done at present. There are sufficient past records to enable such a lump sum estimate to be made with all the accuracy that is needed. Any overcharge or undercharge which may result when final costs are determined, could be taken into account in modifying the rates for succeeding periods. In the case of power, for example, I would suggest that the daily charge to each naval appropriation be a certain definite percentage of the labor expenditures for the day, based on the records for the past few years.

(3) It is believed that similar short cuts, which will be fully as accurate as the present so-called "actual charges," can be adopted, which will result in enabling the Accounting Office to furnish accurate statements of expenditures by appropriations within twenty-four hours after they have been incurred. Monthly allotments are now at a low ebb and the probability is that they will remain at this point for some time to come. Under these conditions when the amount of money available is not sufficient to perform all the work that should be done prompt and accurate statements of expenditures are particularly desirable.

(4) The Bureau of Supplies and Accounts has in a recent circular letter recognized the necessity for such short cuts by insisting that invoices and stub requisitions should always be priced promptly and that where the actual price is not available, an estimated price be used, the difference between it and the

actual price to be taken up on subsequent issues. If the same principle be adopted for all appropriations, the work of the Accounting Office will be greatly simplified, and the present difficulty of controlling expenditures will no longer be the "bugbear" it is now.

(5) With regard to the cost accounting as distinguished from appropriation accounting, it is believed that the present system has run away with its inventors. It is of course always necessary to know the real cost of work performed. This is more essential, however, for a commercial concern than for a government establishment. The present system was adopted partly, if not wholly, in an attempt to obtain navy yard costs which could be compared with those of private plants. Each year, however, certain so-called improvements or additions have been made until the mass of details is such that the real purpose of the work is obscured. If navy yard costs were continually used in comparison with private plants, and if based on these costs, decision was made as to whether work will be done in a navy yard or outside, they might be of some value. But it is well known that the reasons for assigning work to navy yards are usually more political or military than economic. It is therefore suggested that the present accounting system be gone over in detail with a view to reducing, if possible, the many sub-heads of expenditures and the elaborate sub-division of overhead. It is believed that by so doing, equally good results can be obtained for all practical purposes with about one half the number of employees in the Accounting Office.

ADVISABILITY OF ESTABLISHING AT YARDS SEPARATE ALLOTMENTS FOR THE FIELD FORCES, SUCH AS INSPECTION OFFICES, ETC.

(1) It is most emphatically urged that no separate allotments for any such purposes be established. The difficulty and complication of operating navy yards and the accounting work at yards is largely due to the numerous allotments and appropriations that have to be dealt with. Every effort should be made to combine allotments and eventually to combine appropriations rather than to sub-divide them further. The ideal condition would be, that the commandant is given a certain quarterly or semi-

annual fund for running the whole navy yard, requiring him only to report the expenditures in such detail as might be required by the department or by law. Under such conditions commandants could exercise their ability freely and could without any question improve the efficiency of the yards under their command. Every additional appropriation or allotment reduces the commandant's authority proportionately and consequently his ability to improve navy yard conditions. If we ever reach the point where all clerks are paid from the same appropriation, and all ship repair work is paid for by the same appropriation, the resultant economy due to reduction of clerical work and reduction of friction will be nothing short of amazing. It is to be hoped that the new budget system will assist in producing this result.

BRIEF GENERAL DISCUSSION ON THE SUBJECT OF INDUSTRIAL AND MILITARY OVERHEAD CHARGES AND THE FACTORS APPLICABLE TO THE SAME

(1) As stated above, it is believed that the details of the present accounting system are too elaborate. Any attempt to segregate those fixed charges which are due to the necessity for maintaining navy yards as military units in time of war is bound to be an estimate only. A board was appointed some five years ago to establish percentages or factors covering the so-called military portion of the overhead, which was thereafter to be deducted from, and not included in the so-called cost of work. These percentages are necessarily estimates, and always will be estimates, as there exist no means of determining such matters absolutely. There appears to be no reason why these admittedly arbitrary percentages should not be adhered to, unless the Bureau of Supplies and Accounts has been able to collect data for the period of the war. Comparison of total overhead charges during the war period when all yards were worked at maximum capacity, with the pre-war and post-war periods, might perhaps lead to modifying these percentages.

(2) In any event, it is considered desirable to take a sort of average of these detailed percentages and make a flat percentage deduction from the total overhead. Such a method would yield just as accurate results as the more detailed analysis now in effect.

(3) It is considered that the general question of overhead at navy yards has been subject to a great deal of misapprehension. The overhead of a yard exists and continues no matter whether it is actually charged to an expense account number, or allocated to Maintenance Yards and Docks or some other appropriation. Arbitrarily discharging employees charged to overhead, or reducing the pay of capable supervisors, or neglecting to repair machinery as soon as breakdowns occur, or failure to maintain buildings, shops, trucks, drydocks, etc., in good condition, instead of reducing the overhead, actually increase it. Such actions only delay remedying the trouble, and correction at a later date always costs more than if made promptly. The best way to turn out economical work is, no matter what the overhead charges may be, to employ capable and highly paid supervisors and plenty of them; to correct all defects and remedy all breakdowns as soon as they occur; and to provide plenty of the best and most up-to-date tools, appliances, and other necessities for the work.

(4) The present accounting system treats certain items as overhead. If the resulting overhead percentages are considered too high, the way to reduce the percentages (but not the way to reduce the actual overhead) is to change the accounting system rather than to neglect maintenance work that has to be performed.

DISCUSSION

Relativity

(See Page 395, Whole No. 229)

Lieutenant P. J. Searles, (CEC) U. S. Navy.—May I venture some remarks in connection with an article "Relativity" by Lieutenant H. K. Lyle in the March Proceedings?

The author in his article has assumed that the Einstein theory of relativity in its completeness has been accepted by the scientific world, and he also gives the impression that the theory is a finished product ready to be placed in a glass case and admired. This is not quite true. For centuries philosophers and scientists have been endeavoring to answer the question, "Are space, motion, energy, etc., things in themselves, or is there a oneness behind them?" In other words, what is speed, what is energy, how are they related, are they really only different manifestations of the same thing? No definite answer has been made, and in the present state of our knowledge no definite answer can be made. But countless theories have been advanced, of which the Einstein theory is but one, and of which there are numerous modifications. After the Michelson and Morely experiment failed to prove the existence of an ether, considerable discussion arose as to the consequences of the failure. One of the foremost explanations was that advanced by Fitzgerald, who assumed that materials changed their length automatically when they were shifted from a position parallel to the earth's motion to a position at right angles to such motion. Of course there could be no usual method of measuring this Fitzgerald contraction (as it is called), as a yardstick used in measuring would also have its length changed. For example, take the case of a man looking at himself in a plane mirror. He sees what he considers a correct image of himself, and upon applying a tape to the image finds that it shows he is six feet in height. Next he looks at his image in a concave mirror and sees a distorted (or as he considers it) image of himself, but to his surprise upon applying the same tape, the image is still six feet high. This is roughly analogous to the Fitzgerald contraction. The contraction varies with the speed of the object; with the earth's orbital velocity about $\frac{1}{(1000)}$ of the velocity of light, the contraction would be $\sqrt{1-\frac{1}{(1000)^2}}$, or one part in 200,000,000. This means that the earth's diameter in the direction of its

motion would be shortened about 2½ inches. A velocity of 161,000 miles a second vertically upward would reduce any object to half its length at rest; such contraction, however, cannot be measured, for the measuring device would also contract. A slight confirmation is secured by considering an electrically charged sphere. When at rest relative to the earth, the lines of force radiate with equal intensity in all directions, but when the sphere is moved parallel to the earth's movement, those lines of force parallel to the motion (i. e., along the diameter parallel to the earth's motion) are of lesser intensity than those perpendicular to the direction of motion.

There is of course no question of the truth of the relativity of motion. An object on the earth's surface has a motion relative to the earth, the earth has a motion relative to the sun, and the sun (according to modern views) are about halfway between the center and the surface of the universal sphere, 300,000 light years in diameter, and is moving toward the center with a motion relative to other heavenly bodies. But the kind and degree of relativeness is in question. Einstein has given one view, although his putative followers, like Eddington, Tolman, Silberstein, etc., differ to a great extent in details.

Intimately connected with Einstein's theory is the non-Euclidean geometry. For all practical purposes Euclid is right, and has been almost universally considered so. But at different times geometers have devised a geometry applicable to a space in which the Euclidean postulates do not hold. The most famous of these is Lobychevsky with his theory of parallels. Riemann had a system, so had Gauss, and today Minkowski holds force. Perhaps they are right and Euclid wrong, but there is no present way of proving it. Their systems are analogous to medieval theologies. The old systems of gods, angels, cherubs, etc., were workable on paper, but the question was not *"Can* such a system exist?" but *"Does* such a system exist?" The non-Euclidean geometries are logical and *self-consistent,* but are not as yet consistent with observed phenomena. For instance, Minkowski tells of a universe, finite but unbounded, somewhat hyperbolic in nature, with four dimensions; the nearest description of it is of a sort of an old-fashioned phonograph horn which expands out and back on itself—except that whereas the horn is in three dimensions, Minkowski's universe is in four. Perhaps it does exist but we do not know so definitely as yet. Of course time can be considered as a fourth dimension, but it is most certainly confusing when some geometers and relativists attempt to translate time into space and vice versa. As well consider beefsteak or a telephone as extra dimensions and translate them in six meters of steak or forty seconds of telephone line. Perhaps it is possible, but it has not yet been done in practice. Self-consistent theories, no matter how fantastic, are always possible, but they cannot always be applied to the world as we know it to exist.

Einstein differs from Newton in his conception of the reality of what we know as gravitation. The older idea was to consider it as force acting at a distance. Einstein believes that space contains humps or warps, and that

matter traveling through such space is deflected from its straight course by such warps and gives rise to the effect of gravitation—or whatever one may wish to call it. Acceleration also enters into the subject in an abstruse manner. Perhaps this is true, perhaps space containing matter is non-Euclidean, and space without matter is Euclidean. We cannot tell at present, but the balance is still on the side of Euclid because his geometry holds for the world as we know it, though perhaps not for some theoretical universe which may or may not exist. Any kind of a space can be imagined, depending upon the mesh system or co-ordinates used, and any explanation can be given to any phenomena, but such imagined explanations are not necessarily true and should be received with caution until proven. The discussion might be extended into all lines of physics, etc., and with varying assumptions we might prove that momentum and energy are the same thing, that speed can be changed into mass and vice versa, but all such theories need definite proof before acceptance. And despite Lieutenant Lyle's assertion, the truths of Einstein's theory are not proven. Consider the three so-called proofs:

1. Light is affected by gravity. This is probably true, although the amount is in doubt. Using Newton's mechanics, a ray of light passing near the sun, as the light from Beta Cassopeia did during the eclipse expedition mentioned by the author, should have been deflected about 0.75 seconds of angular distance. According to Einstein, the deflection should have been about 1.75 seconds. The Sobral, Brazil, expedition photographs gave a deflection of 1.98: the Principe, Africa, photographs showed 1.62. These figures are close to the Einstein prediction, but not exactly so. Any errors in the photographic clockwork, warped plates, etc., may have caused a considerable error. Not until more such photographs are taken, can we accept any result as true.

2. Advance of the perihelion of Mercury. The perihelion of Mercury is advancing at the rate of 574 seconds of arc per century (not 43 seconds as stated by the author). Due to gravitational influence of other planets, 532 seconds per century are accounted for by Newton's theory. According to Einstein's theory, all 574 seconds are accounted for (although the author says that according to Einstein the advance should be but 43 seconds). But what does this prove? Perhaps other heavenly bodies, not yet discovered, are exerting an unknown effect; perhaps "cosmic dust" (if it really exists) may account for it; perhaps a number of factors are at present not sufficiently known to account for the entire advance. A very significant point that is not mentioned by enthusiastic Einstein followers is that the Newtonian theory accounts accurately for the known aberration of the perihelion of Venus, which aberration is not at all what it should be according to Einstein. Dr. Pond has a theory of his own, more or less plausible, which accounts accurately for aberrations of all planets.

3. Slight advance in the lines of the solar spectrum as compared to the laboratory spectrum. Due to the relative motions of the earth and the sun, those bodies are at practically all times approaching to or receding from

each other. Such motion causes a shifting of the lines of the spectrum toward one side or the other (depending upon whether the earth is approaching the sun or the reverse). This is the Doppler effect, long known to physicists, and easily measurable. But Einstein says that in the intense gravitational field of the sun the spectrum should be shifted slightly toward the red end; the displacement being plus 0.0080A. (A is the Angstrom unit or 0.0000000001 meter.) Due to the difficulty of separating the Einstein effect (if it exists) from the Doppler effect, no definite results have been found. St. John at Mt. Wilson detected plus 0.0018A shift for the cyanogen lines (only certain lines can be used), although he is not positive about it. Evershed found plus 0.0060 at the North Pole of the sun and plus 0.0080 at the South Pole, also that some lines gave a greater shift than others, although according to Einstein the amount of shift is constant and independent of the kind of lines.

Personally I believe Einstein has a portion of truth in his theories, somewhat overlaid by a large amount of chaff which must be cleared away before we can get a true perception of the universe. He most certainly is an ingenious thinker, possibly a great physicist, and deserves universal recognition for his determined attack on the problems of time and space. Any attempt to place the fundamentals of physics on a solid basis deserves praise. But Einstein has become too metaphysical, he has become wrapped up in fanciful multi-dimensional theories, has wandered into the aridity of mathematical abstractions, until his world is no longer the world in which we actually live. Either he or his successors must clear out the abstractions and rescue the basic theory from the muddy morass of speculation. Then we may have gained an advance in knowledge well worth the struggle.

The General Board

(SEE PAGE 189, WHOLE NO. 228)

CHIEF CONSTRUCTOR D. W. TAYLOR, U. S. N.—The article of Admiral Wainwright in the February number of the NAVAL INSTITUTE PROCEEDINGS on The General Board is a valuable contribution to the history of the navy department, although the author seems at times to take a roseate view of the capacities and achievements of the Board, which is his nominal subject.

I believe the general board is one of the most valuable organs of the department, and hope it will long continue so. In its early years it had some vicissitudes and was at one time something of a storm center in the department. The author does not touch upon a somewhat remarkable occurrence in 1904. Secretary Moody then recommended the "legalizing" of the general board, and a bill was introduced on which the house naval committee held hearings in the spring of 1904. Secretary Moody appeared before the committee in advocacy of the bill, which was a step toward the establishment of a general staff. On April 28, 1904, Assistant Secretary Darling, who stated that he appeared with the knowledge and consent of

Secretary Moody, made a violent attack before the committee on the bill and virtually killed it. Of late years the general board has settled down and has certainly done very useful work, which I am inclined to think is hardly appreciated by the service at large at its true value.

A disinterested body such as this, composed of officers of wide and mature experience, constitutes a body of elder statesmen, as it were. It is a kind of court of appeals for all sorts of complicated and difficult questions, and as the guide, philosopher and friend generally of the secretary of the navy, is invaluable.

The author does not confine himself to the subject of The General Board, and is somewhat discursive at various points. He does not approve of the board on construction, using against it the stock arguments we heard for many years. I have no wish to discuss the merits or demerits of the board on construction, abolished so many years ago, but the "horrible example" of its shortcomings, quoted by the author, impels me to come to the defense of the memory of my old chiefs—Chief Constructor Hichborn and Secretary Herbert—who honored me with their friendship as long as they lived, and who are placed in a very bad light by the author's circumstantial recital. The case to which he refers is evidently that of the *Dahlgren, Craven and Farragut* in 1896 and his statements are a remarkable illustration of the fallibility of the human memory.

It is a fact that there was a controversy in 1896 regarding these torpedo boats, but this is about the only fact accurately remembered by the author. As to the subject of the controversy, the participants in the controversy, the incidents of the controversy and the decision of the controversy, his memory has woefully deceived him. The papers in the case are still on file and have been consulted by me. I quote below the author's statement, and have indicated at suitable points, by *numbers* in brackets, the statements which the record shows to be absolutely erroneous. I have also indicated, by *letters* in brackets, a few statements which are not specifically controverted by the record, but are so inconsistent with known facts in the record that I believe them erroneous:

The decisions of this board [board on construction] were not always approved by the secretary. Once when the issue was the plans for several new torpedo boats (1), the military members all decided to adopt plans similar to a British type (2), the largest then built, that had proved quite successful and was somewhat larger than any we had attempted. The chief constructor wanted to adopt a much smaller boat after a French design (3), one purely experimental and one the designer admitted had been built as an experiment to obtain speed in a small boat without serious consideration of other military factors (a). The chief constructor took his minority report to the secretary (4) and obtained a decision in his favor by the argument that as torpedo boats were sneak boats, the smaller they were the better they could sneak upon the enemy, and all questions of seaworthiness, endurance or armament were brushed aside (b). It was only by the great influence of Admiral Sampson, then chief of the bureau of ordnance, that the secretary was induced to reverse his first decision and make a fifty-fifty one (5). The big boats proved good

for their time; the small ones proved a failure and were called the bath tubs. Although well constructed at Bath, the design was a failure. Thus was money wasted and progress retarded by the decision of a civilian who lacked the groundwork of knowledge upon which to found his decision (c).

The Naval Appropriation Act of June 10, 1896, which gave us three battleships and a number of other craft, authorized "three torpedo boats, to have a maximum speed of not less than thirty knots, to cost in all not exceeding eight hundred thousand dollars." These vessels were required to be constructed by contract, award to be made to the "lowest best responsible bidder."

It was required that contracts should be made within 120 days, namely, on or before October 8, 1896. No plans of these boats were prepared by the navy department, the circular defining their chief characteristics stating that:

> The department in advertising for the boats of thirty knots' speed to be built by contract, will invite proposals for the construction of the hull, including engines, boilers, and appurtenances, and equipment, complete in all respects, in accordance with the plans and specifications provided by the bidder.

Bids were received September 18, 1896, and referred for analysis and recommendation to the chief constructor (Hichborn) and the engineer-in-chief (Melville) as then customary.

On September 28, 1896, the chief constructor and engineer-in-chief reported to the department, recommending an award.

This report was returned to the bureaus September 29, 1896, for further report and recommendation. The bureaus were directed also to confer with the bureau of ordnance concerning the armament and ordnance weights proposed to be carried. On October 1, the chief constructor and the engineer-in-chief made a second report. The same day (October 1, 1896) this second report was returned to the bureaus for further report, and this time the chief of the bureau of ordnance, Admiral Sampson, was associated with the other two chiefs making a board of three. The chief constructor and the engineer-in-chief joined in making a third report. Also under date of October 3, 1896, they made a supplementary report. Under date of October 5, 1896, Admiral Sampson submitted a minority report—the only report submitted by him and the only minority report concerned in this transaction.

The record shows also that on the same date one bidder submitted a brief on the subject of the proper award under the law and that on the same day (October 5, 1896) the secretary decided the award. This haste was necessary because the contracts had to be made by October 8 under the law.

Coming now to an analysis of the author's very circumstantial recountal, in the light of the facts we have the following:

(1) Once when the issue was the plans for several new torpedo boats.

The matter of the plans for the torpedo boats in question was never an issue in the board on construction because the matter was never referred to it.

(2) The military members all decided to adopt plans similar to a British type.

As the matter was not before the board, statement (2) is obviously erroneous.

(3) The chief constructor wanted to adopt a much smaller boat after a French design.

The chief constructor as a member of the board on construction did not pass upon the question of plans. If the statement is taken as representing his views on the matter he did pass on, the preference ascribed to him is erroneous. See (b) below.

(a) One purely experimental and one the designer admitted had been built as an experiment to obtain speed in a small boat without serious consideration of other military factors.

I have been able to discover nothing in the record to warrant any such statement, and cannot believe it correct. It is calculated to make the designer, M. Normand, the famous French torpedo boat designer and builder, turn in his grave.

(4) The chief constructor took his minority report to the secretary.

The chief constructor made no minority report in this matter. He united with the engineer-in-chief in signing three reports and an explanatory letter. Up to the time of the third report no one else was concerned in the matter. Just before the third report the chief of ordnance was associated with the other two, making a board of three. The chief of ordnance refused to sign with the others, and submitted a minority report —the only minority report in this matter.

(b) and obtained a decision in his favor by the argument that as torpedo boats were sneak boats, the smaller they were the better they could sneak upon the enemy, and all questions of seaworthiness, endurance or armament were brushed aside.

If the chief constructor made any such absurd argument, it was wholly inconsistent with his reports of record, in which he was always associated with the engineer-in-chief. The record shows clearly that questions of seaworthiness, etc., were not brushed aside. Conclusive evidence of the views of the majority, the chief constructor and engineer-in-chief, upon the question of size is contained in the minority report of Admiral Sampson who said:

There is apparently no diversity of opinion among the members of the board in regard to the desirability of the larger size boat, as is shown by the following extracts from the reports of the chief of bureau of steam engineering and chief of bureau of construction and repair.

One of the majority reports contains explanations of the differences between the torpedo boat proper and the torpedo boat destroyer type—then in the early stages of its development.

(5) It was only by the great influence of Admiral Sampson, then chief of the bureau of ordnance, that the secretary was induced to reverse his first decision and make a fifty-fifty one.

Any decision reversed was not upon the question of size and type of boats. The papers show that the secretary at one time instructed the bureaus that the bids of one bidder could not be considered under the law. The next day he withdrew that instruction, but in his final and *only* decision on the award of contracts he ruled out the bids in question. The decision was hardly a fifty-fifty one. It was wholly against the minority but the award of contracts was in accordance with the recommendation of the majority on the assumption that a certain bid was legal and entitled to consideration though when making the award the secretary ruled the bid in question could not be considered. On that basis the majority had made a somewhat different recommendation.

(c) Thus was money wasted and progress retarded by the decision of a cilivian who lacked the groundwork of knowledge upon which to found his decision.

The question at issue was not primarily "military" but one of the legal award of certain contracts on the basis of bids received. The complications were mainly legal complications, and the secretary of the navy, by profession a lawyer, certainly could not be said to lack the groundwork of knowledge.

The main questions were legal and may be briefly stated. They were:

First—Whether the bid of the Herreshoff Company could be accepted within the law.

Second—Whether the bid of the Bath Company could be rejected under the law.

There was a third question. Congress had specifically authorized torpedo boats. There was only one bidder for torpedo boats proper as understood at that time. One bid was for a duplicate of the latest British torpedo boat destroyer (the *Desperate* of 240 tons' displacement—this was in 1896) and the other bids were for vessels betwixt and between the two types as then existing. So the department had to decide how far it could go in building destroyers under an authorization for torpedo boats. The decision was to build a substantial duplicate of the latest British destroyer and two substantial duplicates of the latest French torpedo boats. The record shows however that before making this award the secretary of the navy obtained a waiver from the Bath Company of their previously asserted right under the law to a contract for three torpedo boats.

Having endeavored to give the facts regarding the author's relation concerning the secretary of the navy of twenty-six years ago, I should like to comment briefly on his statement concerning the secretary of two years ago. The author says:

When Mr. Daniels was asked by the Hale investigating committee for the general board's plan for the war, he answered "search me." *After his*

departure from the department, his desk was searched and the plans found; and it is safe to assume that had this plan been followed, many things would have been undertaken at once, that either never were started or were undertaken some time after we entered the war on paper.

While I have not searched the two million words or so of the Hale committee's record for the part of it dealing with this plan, my impression is that the particular plan referred to was by no means of the importance ascribed it by the author. It was something submitted by the general board in February, 1917, of such a nature that it did not keep a copy of it. It is well known of course that as soon as we entered the war in April, 1917, the general board was almost at once in close consultation with French and British admirals and prepared to make recommendations with full information as to the real situation.

As regards the statement italicized by the author, *"after his departure from the department his desk was seached and the plans found,"* this has been current gossip in the navy department, but seems to be nothing but a "galley yarn" out of whole cloth. The best information I can gather is that when Secretary Daniels departed from the navy department, both of the desks which he used were absolutely empty. This would be natural, as they were at once taken over by his successor. If this is correct, the plan could have been found in his desk after his departure only if it were placed in his desk after his departure. The "galley yarn" usually has it that the general board now has the plan in question. I have been assured, however, that this is not the case.

The author is evidently a strong believer in a general staff for the navy, and considers the general board as tending in that direction, the aid system of Secretary Meyer a further step forward, and the establishment of the office of operations as a step backward. I should like to say a few plain words on this general staff question:

What is a general staff? Without answering that question for the present, it may be pointed out that one complication in our conception of a general staff is due to an eccentricity of the English language. We are apt to consider that a general staff is a staff to run things in "general." As a matter of fact, in Germany, the birthplace of the general staff and held up to us before the war as the location of the perfect and infallible general staff, there was before the war the general staff for the army and the admiral staff for the navy. The general staff was the staff of the general, the naval or admiral staff was the staff of the admiral. For many years before 1914 Von Tirpitz was the head of what corresponded fairly closely to our navy department, but he was not the head of the admiral staff and his principal asset seems to have been his ability to get favorable action from the German *Reichsrath*. Apparently the Emperor, the commander-in-chief, had a personal staff separate from the admiral staff, but which was naturally not without influence upon the course of events.

The author appears to have a very low opinion of the law establishing the office of operations as an approach to the general staff idea. In Great

Britain at present there is a naval staff (they do not call it a general staff) very highly organized, and if the author will consult an admiralty 1921 pamphlet on *Distribution of the Duties of the Naval Staff* he will find that the British naval staff is organized and apparently operates almost exactly as our office of operations would be organized and would operate in strict compliance with the letter and the spirit of the law establishing it. So certainly from the British conception of a staff for the navy, the law creating the office of operations could not be regarded as a step backward.

I have not yet answered the question "What is a general staff?" It has been advocated for our navy now for many years, and so far as I can judge when we get behind the verbal camouflage and smoke screens of most of its advocates, one essential feature is that it is an organization where the secretary of the navy is reduced to a figurehead. This is no new idea in the United States navy, but has existed as long as we have had a navy department. At times it has prevailed. In 1815 congress established a board of navy commissioners, composed of three officers of the navy which, though nominally under the office of the secretary of the navy, was empowered to "discharge all the ministerial duties of said office, relative to the procurement of naval stores and materials and the construction, armament, equipment and employment of vessels of war as well as all other matters connected with the naval establishment of the United States."

These were broad powers. From 1815 to 1824 and again from 1827 to 1837 the board of navy commissioners was headed by John Rodgers, one of the greatest men who ever served in the United States navy, and yet in 1842 congress abolished the board which for some ten years had been much criticized both in and out of the navy. For instance, Commodore Charles Stewart wrote concerning it that the "absence of economy in the construction, equipment and repair of our vessels; the diversity in their models, classes and qualities; the capacity of some and the worthlessness of others; the excessive waste of continual experiments, have never been surpassed, if ever equaled, in any other naval establishment of the same limits."

The act of 1842 restored the full authority and responsibility of the secretary of the navy and established the bureau system where the immediate subordinates of the secretary are directly responsible to him and to him alone. These principles have never been changed by law, but in 1869, a new secretary, A. E. Borie, virtually abdicated by issuing an order that "all matters relating to the navy coming under the cognizance of the different bureaus will be submitted to Vice-Admiral Porter before being transmitted to the secretary of the navy." Secretary Borie lasted but a few months, and the experience of the navy with Porter *de facto* secretary, and Secretary Borie a figurehead, was not a very happy one.

For twenty years or so now we have heard much advocacy of a general staff, which, as I have already said, would render the secretary of the navy a virtual figurehead. I am firmly convinced that any organization which produces this result would be a fatal mistake.

The navy *must* be considered in this connection from the non-naval point of view. It is not an independent organization, and like every other part of the executive it is in the end dependent upon the legislative branch of the government representing directly our ultimate masters—the people of the United States.

Congress is our board of directors, as it were, for a part of the functions performed by an ordinary board of directors of a large corporation. Congress does not appoint the officers of our corporation as a board of directors usually does, though if we have an officer who is not *persona grata* with Congress, it is apt to find means to impress its views. Congress does, however, have the most important functions of a board of directors. It controls the purse strings not only in sum but in detail. Evidently then it is essential to the navy that it be represented in the best possible manner before its board of directors.

The best spokesman for the navy is its civilian secretary. Even those who advocate making the secretary a figurehead generally admit this. They overlook, however, one vital fact: The navy department is not very far from Capitol Hill. No secretary can be a figurehead in the navy department and receive proper consideration on Capitol Hill. Admiral Wainwright says, "The civil element always should and always will dominate, and the military experts will always have to struggle for reasonable preparation. . . ." Very true, but just who is to be the civil dominator of the navy? Is it to be the civilian secretary, clothed with authority, looked up to as its head and loyally supported by the whole navy, or is it to be our board of directors in congress, dealing reluctantly with a general staff or other body of men in uniform (always distasteful to the English-speaking legislator) able to dominate only indirectly by legislation or by withholding money, with ingrained distrust of the military experts as incapable of understanding or appreciating the point of view of the congressman?

Many officers have wondered at the unprecedented success of Secretary Daniels in his dealing with congress. If some chemist could analyze the intangible elements going to make up his influence I am sure there would stand out as important, if not pre-eminent, the fact that he was under constant attack from naval officers. Every knock was a boost, in that it helped to impress upon congress the belief that it was not dealing with a figurehead, and that to paraphrase the author's words the civil element was dominating in the navy department.

Congress, and the people of the United States whom congress represents, will never be permanently satisfied with any other arrangement.

It may be that in some guise or other the general staff advocates in the navy will some day achieve an organization where the civilian secretary will be a negligible quantity. It is my firm belief that such an achievement will be on a parity with the case where "the operation was a success but the patient died."

U. S. NAVAL INSTITUTE

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Commander C. P. Eaton, U. S. Navy, Retired. Lieut. Comdr. P. H. Sheridan, U. S. N. R. F.

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Index to Proceedings

The attention of readers of the PROCEEDINGS is invited to the classified analytical index for numbers 101 to 200 inclusive, which is noticed under "Publications." This is a most complete index, which has been prepared at considerable expense in order to make readily available the information contained in both the articles and the notes of these issues. Only a limited number of copies have been printed. Price, bound in cloth, $2.35; bound in paper, $1.85.

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Whole Nos. 6, 7, 10, 13, 14, 15, 17 and 194 of the PROCEEDINGS are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 75 cents per copy.

ANNAPOLIS, MD., April, 1922.

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PROFESSIONAL NOTES

PREPARED BY

LIEUTENANT R. A. HALL, U. S. NAVY

GENERAL ARRANGEMENT

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FRANCE

WARSHIPS DROPPED BY FRENCH SENATE.—The French Senate, by a vote of 235 to 2, adopted the naval program calling for abandonment of the construction of warships of the *Normandie* type, the transformation of the dreadnaught *Bearn* into a mother ship for airplanes, and the laying down of certain light units.

In the discussion preceding the vote Viscount de Kerguezec, president of the Senate's navy committee, declared:

"Henceforth, it will be impossible to make any resolution whatever concerning naval matters without taking into account what happened at Washington."

M. de Kerguezec discussed at length the much-talked-of Castex incident, and declared that the opinion of Captain Castex, whose article on the submarine, published by the *Revue Maritime*, figured in the submarine discussions at the Washington conference, was purely personal. The speaker declared the French Parliament long ago repudiated the doctrine of submarine piracy and considered the submarine a purely defensive weapon.

M. de Kerguezec strongly urged adoption of the program because, he said, it soon would be impossible to embark France's crews and officers for lack of ships. "We were much surprised to learn," he said, "that the naval program laid before the Washington Conference in the name of France was drawn up by the naval general staff, although really no naval program can be presented in the name of France unless it has been approved by Parliament."

The French naval program, as previously cabled to this country, provides for the construction of three cruisers, of 8,000 tons, 98,000 horse-power, 38

knots, with eight guns of 150 millimeters each, four guns of 75 millimeters and twelve torpedo tubes; six torpedo destroyers and twelve torpedoboats, the destroyers of 2,500 tons, 35½ knots, with six 18-centimeter guns and six torpedo tubes, and the torpedoboats of 1,400 tons, 32½ knots, together with twelve submarines of 1,100 tons and an action radius of 7,000 miles. —*Washington Post,* 18 March, 1922.

FRENCH AIR BUDGET.—The French air budget for 1922, as passed by Parliament, totals approximately 436,000,000 francs. The main appropriations are: Minister of War, for home squadrons, 214,287,500 francs; Algeria and Tunis, 9,936,490 francs; Morocco, 22,173,092 francs; total 246,397,082 francs. Under Secretary of State Department for Aeronautics: 147,219,970 francs, which includes foreign air attachés, 200,000 francs; technical service, 5,400,000 francs; prizes and subsidies for commercial aviation, 45,382,000 francs. Ministry of Marine, 37,318,543 francs; Ministry of Colonies, 4,991,000 francs.

Of considerable interest and importance are the figures now available for the past year's growth of flights and passengers and freight carried. For the full twelve months to December 31, 1921, compared with 1920, the figures are: 1921—flights, 4,022; passengers, 13,369; goods, 150,309 kg.; mails, 3,308 kg. 1920—flights, 3,359; passengers 6,850; goods, 120,745 kg.; mails, 1,474 kg. For the month of December the figures are: 148 flights (arrivals and departures), 359 passengers, 7,277 kg. of freight, and 84 kg. of mails. These figures are for the airways in operation between Paris and London; Paris, Brussels, and Amsterdam; Paris, Strasbourg, Prague, and Warsaw; Paris and Amsterdam; and Paris and Havre.—*Aviation,* 3 March, 1922.

OIL BY PIPE-LINE TO PARIS.—It seems probable, says a Paris report, that within the next three months plans may be approved for the laying of a pipe-line between Havre and Paris to convey petroleum and petrol direct from tank steamers to the French capital. The concessionaires have to establish at their own cost works for the transport of a minimum of 2,400 tons of petroleum per day between Havre and Paris, with reservoirs at each end of the line representing a minimum total capacity of 60,000 tons.—*Engineering and Industrial Management,* 2 February, 1922.

FRENCH PORTS OPEN TO GERMAN VESSELS.—German vessels bound for South and North America will enjoy all privileges of the international commerce and shipping regulations and will be permitted to call at French ports, "providing the German companies fulfill the commerce and shipping rules." This statement was made to the Associated official quarters today.

First among these rules is that a request be made for permission to enter a port of call, which, it was said, was not done in the case of the German steamer *Cape Polonio* or in any other instance; thus there was no request and no refusal. (It has been alleged by the Germans that the steamer *Cape Polonio* on her recent trip to South America was refused permission by the French to touch at Boulogne, but official denial of this has been made by the French government.)

The French Ministry of Merchant Marine makes no secret of its belief that there is a question of boycott against French shipping at Hamburg and Bremen, consisting of refusal to allow the same privileges to French tonnage as obtain for British and other steamers. But, it is declared at the ministry, this question is not related to the reported refusal to allow German liners to call at Boulogne.—*Washington Post,* 5 March, 1922.

ACUTE DEPRESSION IN FRENCH SHIPBUILDING INDUSTRY.—The depression in the shipbuilding industry is being more acutely felt in France than in

other European countries. The country's merchant marine has been reconstituted without the home shipyards contributing to its rehabilitation, while the allocation of surrendered German tonnage has provided France with a tonnage in excess of her requirements so that there is little prospect of the French shipyards finding much work to do in the future. These number twenty in all and employ in normal times 60,000 men. They are capable of turning out 500,000 tons of new shipping a year.—*Nautical Gazette*, 11 March, 1922.

GERMANY

GERMAN DISARMAMENT—EFFECT ON INDUSTRY.—It is said of the Washington Conference that the victorious powers, having disarmed their enemies, are now voluntarily disarming themselves. The effect of this disarmament on German industries will be of particular interest at this juncture, and a brief review of the position may be welcomed by our readers.

The naval clauses of the Peace Treaty can be summarised shortly as follows: (a) Germany may have a navy not exceeding the following number of ships in commission: six pre-war dreadnoughts, six light cruisers, twelve destroyers, and twelve torpedo boats, with no submarines of any type at all; (b) these ships may only be replaced after a definite life and the replacing ships must not exceed the tonnage given below:

	Life Years	Displacement Tons
Armoured ships	20	10,000
Light cruisers	20	6,000
Destroyers	15	800
Torpedo boats	15	200

(c) The personnel is to be reduced to 15,000, with not more than 1,500 officers; (d) all warships under construction at the signing of the Armistice are to be broken up.

The remainder of the German fleet, except for some very old ships, having been surrendered it will be seen that the reduction in that fleet is much more drastic than the proposals of the Washington Conference. In Germany, as in this country, the establishments affected are of three kinds, viz.: (a) the old Imperial establishments corresponding to our Royal dockyards and arsenals; (b) the large armament works and shipyards which specialised in naval and military work; (c) smaller works only utilised during the Great War and now engaged in their pre-war occupation.

The main establishments under heading (a) include the following: the ex-Imperial dockyards at Wilhelmshaven, Kiel, and Danzig, the arsenal at Spandau near Berlin, and the torpedo factory at Friedrichsort on Kiel Bay. So far as the dockyards are concerned, Danzig having been taken away from Germany the yard there is not under its control. It has been decided to leave Wilhelmshaven as a building yard to help in supplying the warships required in the future. It is capable of building the hull and supplying the machinery of a battle cruiser of the *Hindenburg* class. It also has graving docks large enough to accommodate the biggest ship allowed for the post-war fleet. These occupations only utilise a part of this extensive dockyard, and the remainder has been separated and handed over to a company under the control of the German Treasury, which is developing it on commercial lines, it being suited for general engineering work and the building of small steamers, etc.

The ex-Imperial yard at Kiel has also been divided into two parts. One which contains the graving docks and basins will be used as the

Baltic Sea base for the post-war fleet, and the remainder, including the building slips, the engineering shops, etc., has been transferred to a department under the Treasury and is being worked as an ordinary shipyard. Work on some 8,000-ton steamers has been begun. The department of the Treasury previously mentioned has also taken control of the Friedrichsort torpedo factory and the arsenal at Spandau. In all cases the management has been recruited from the officials previously attached to each place, but their number and status have been altered to agree with the reduced personnel and the changed conditions. The number of employees in these various establishments as given in *Schiffbau* have varied as follows: The oldest dockyard, that at Danzig, employed about 3,500 men before the war and increased its staff to 9,000 men in 1918. This yard, as mentioned before, is not now under German control. The Imperial yard at Wilhelmshaven employed 11,000 men in 1914 and this number increased to 23,000 in 1918. The post-war numbers have dropped to 11,000, of which about 4,000 are employed in the commerical yard. The employees at the Imperial yard, Kiel, numbered 9,200 before the war, but a total of 17,000 was reached in 1918. After the Armistice the number was reduced to about 11,800, of which the greater number were absorbed by the commercial part of the yard. The big torpedo factory at Friedrichsort increased its numbers from 3,000 to 5,500 during the war. When transferred to the Treasury the personnel had been reduced to the former figure. These reductions in personnel have led to a great reduction in the number of permanent officials. At present they number less than twenty-five per cent of the pre-war figures.

It is typical of the existing *régime* that efforts should be made to use the state yards and factories up to the hilt to meet the needs of the future. Control has passed from the military to the civil authorities, and work has been distributed so as to give employment generally. This state enterprise is favoured by the workmen generally, and they resent any suggestion to transfer any of these industrial concerns to private owners. The conditions of labour, hours, and wages are standardised throughout the country. There are no doubt political reasons for the adoption of this form of nationalisation. It is notorious that the dockyard towns were centres of unrest, and revolts in them precipitated the asking for the Armistice. By giving employment this spirit will be quieted. On the other hand, the unemployed official class are very discontented and generally have monarchistic tendencies.

The second type of establishment corresponds to our big armament works. The firm of Krupp was the outstanding example. With its steel works at Essen, its shipyard at Kiel and the allied establishments throughout the country, it employed about 200,000 hands during the war. The M. A. N. and A. E. G. groups also employed thousands of men on munitions, and the optical works of Zeiss and Goerz were also on war work entirely. In short, all the big engineering concerns of Germany were engaged on war contracts, and when the Armistice came had to be transformed to a peace production basis.

It has always been the rule to build the great majority of the German fleet in private shipyards, and, in fact, as mentioned previously, only one Imperial yard could build a battlecruiser, namely, Wilhelmshaven. So far as Kiel was concerned it could build smaller battleships and light cruisers. Apart from one battlecruiser on the slips at the former dockyard and one light cruiser launched from Kiel, the whole of the warships and submarines under construction at the time of the Armistice were being built in private shipyards.

The amount of work in progress was as follows: battleships, 3; battlecruisers, 4; light cruisers, 7; torpedo craft, 114; submarines, 240.

In addition, orders had been placed for two large cruisers and one small cruiser, and over two hundred submarines, but work on them had not been begun.

The effect of the sudden stoppage of work on this big programme was to dislocate the shipbuilding and marine engineering industry. As with the auxiliary vessels which were in hand at smaller yards for the navy, and were also stopped, it represented practically the whole of the work in progress at the time. Labor trouble arose immediately, and the breakdown of the transport arrangements, the shortage of fuel and all raw materials accentuated the difficulties in the yards. A form of communistic control of industry was attempted, and for a period the Workmen's Councils took charge. It was no uncommon thing to see the red flag flying over works. In Hamburg, which had suffered severely from the blockade, the shortage of fuel and food being pronounced, two of the largest shipyards closed down for want of fuel. In actual fact, a portion of the men on the books could have been employed, but the trade unions refused to let them work unless all were paid. The end of the war brought a general slackening of effort and demands of all kinds for improvement in pay and conditions of labour. The street fighting which was prevalent interfered seriously with industry. With the establishment of a stable government this phase passed and conditions steadily improved. Strikes, except for political purposes, have been very rare, and the output is now nearly up to the pre-war figure. Piecework and overtime, banned at the first flush of the revolution, have gradually been reinstated and are now the general rule.

The same shipyards build both warships and merchantmen, the plant required being practically identical. In fact, most of the large yards under heading (b) normally had both types of ships under construction at the same time. Thus the only problem was one of obtaining work. Immediately after the Armistice and up to the signing of the Peace Treaty there was a large volume of reconditioning and refitting work as well as the completing of merchantmen due for surrender to the Allies, which kept the reduced staffs busy. In addition, such yards as were building submarines had to destroy those vessels.

By the time peace was signed the conditions had materially improved. The management could estimate the cost and time on a job fairly closely and the workmen did not insist on so many of the rules which tend to restrict output in this country. Accordingly, of the large volume of work which was released when peace was signed, a considerable portion from neighbouring countries went to German yards. In addition, the warships under construction detailed above had to be broken up, and many men found employment on that work.

It is remarkable that the shipbuilding industry of Germany has profited from causes, most of which are the consequence of that country losing the war; but it must be remembered that the German workman has, apart from the short period of unrest previously mentioned, assisted in every way to put the industry on a stable basis.—*The Engineer*, 10 March, 1922.

GERMAN AND AUSTRIAN NOTES.—Vice-Admiral Rogge, formerly director of the Ordnance Division of the German Marine-Amt, writes in the *Marine Rundschau* to query certain statements made in the British technical press last September concerning comparative trials of British and German armour-plates, the latter taken from the *Baden*. These trials, it will be recalled, demonstrated the superiority of the British plates over the Krupp product. Admiral Rogge adduces a number of facts and figures relating to comparative tests held in Germany before and during the war of British, French, and Krupp plates, from all of which, he claims, the Essen armour emerged triumphant. His article closes with

the following passage: "On the basis of our own proving-ground experience, therefore, we can justly claim to have possessed at the beginning of the war the best armour in the world, and which was, in particular, superior to the British. Moreover, it was the cheapest armour. One cannot resist the conclusion that the British have circulated unverified reports of comparative tests in order to 'puff' the British armour-plate firms, and to this end have belittled the German material."

That is, of course, the stock German reply to every foreign statement that reflects on the quality of German products, but it comes with an ill grace from those who before the war carried on a widespread propaganda against British naval material and lost no opportunity of publishing, both in their own press and in foreign journals, false and disparaging accounts of our ships, ordnance, armour-plate, and other equipment. All this was done with an eye to attracting foreign naval contracts to Germany. Admiral Rogge alleges that at the Battle of Jutland not a single British A. P. shell detonated after passing through the armour of a German ship. The value of his rejoinder as a whole may be judged by this one statement, which has been disproved by German accounts of the battle (e.g., von Hase) and by photographs taken on board German ships after the battle.

The *Marine Rundschau* prints the following paragraph about the four British battle cruisers of the super-*Hood* class, since cancelled: "These ships are not to have the anti-torpedo bulge outside the hull, as is the case in all post-war vessels above the light cruiser category. The ground for this decision may have been that an extension of beam due to a bulge of one or two metres in width would have necessitated docks larger than those now available. The reduction in speed resulting from the bulge has hitherto been accepted. The Admiralty maintain, however, that they have not given up the ideal of the anti-torpedo bulge, but have simply transferred it to the interior of the ship for reasons of convenience. Actually, this seems to show that British constructors have adopted the German and American principle of sub-division, that is to say, an imitation of the German torpedo bulkhead." It would be interesting to learn when and where the Admiralty made any such statement as that imputed to them.

In view of the mutinies which paralysed the high sea fleet during the war, one would suppose that the present German naval authorities would do their best to discourage politics on the lower-deck. It seems, however, that an exception is made in favour of political propaganda on reactionary and *revanche* lines, for the semi-official organ of the Marine-Amt warmly recommends, as suitable for the men's libraries, a new book entitled *The Guilt of the Enemy Alliance*. It would be interesting to know whether they are equally broadminded in respect of pacifist and socialistic literature.

In a series of interesting articles on "Austria-Hungary as a Sea Power," two former officers of the "K. and K. Marine" review the peculiar political and economic conditions that obtained in the dual monarchy and their effect on naval policy. It seems that in order to placate Hungary, a large share of Austrian naval contracts had to be allotted to Hungarian yards, although the latter were not really capable of undertaking such work. For instance, the battleship *Szent Istvan*, the cruisers *Helgoland* and *Novara*, the *Tatra* class destroyers, and the 250-ton torpedo-boats of the *F*-class were ordered from the Danubius yard, Fiume, at a time when its resources were wholly unequal to the work involved. The result was serious delay in the completion of these vessels, notably the *Szent Istvan*. It was Hungarian opposition that prevented the building of railways in Dalmatia which would have enabled the navy to utilise the magnificent harbours of that coast as war bases. Hungary would do nothing calcu-

lated to diminish the importance of her own port of Fiume. Not until after the outbreak of war was her opposition to the Lika railway withdrawn, and then it was too late. The navy was thus tied to a single base, Pola, and was never able fully to develop a base on the southern coast, which would have been more advantageous from the tactical point of view.

With so many different nationalities assembled under one flag, it was inevitable that racial antagonisms should affect the personnel of the Austro-Hungarian navy. In one large ship, the authors state, no fewer than ten nationalities were represented. Croats from the coastal districts made excellent seamen and stokers; their intelligence was limited, but they were staunch and loyal, and did their duty almost to the very end. The Italian element was comparatively small; it was "not regarded as fully trustworthy, and was responsible for cases of sabotage, espionage, and high treason, chiefly the work of so-called 'intellectuals.'" Most specialist posts were filled by Germans, Czechs, or Hungarians, and the technical corps as a whole enjoyed a high reputation. The Czechs serving in the navy are described as having been the cause of most of the trouble, and it was they who finally seduced the Croats and Slovenes from their allegiance. The authors seem to think that had the German element predominated, the mutinous spirit would have been less in evidence; but this theory is hard to reconcile with what occurred in the German navy during 1917 and 1918. They pay a warm tribute to the character and professional attainments of Austro-Hungarian naval officers. Training at the Fiume Naval Academy was strict and very practical and the technical education was exceptionally thorough. Among the graduates of this academy there prevailed a spirit of comradeship in which racial jealousies had no part. Owing to the shortage of officers, however, it was necessary to reinforce the establishment with a large number of special-entry cadets, whose loyalty was not always beyond cavil.

But discipline and morale suffered most through the incursion of reserve officers from the merchant service at the outbreak of war. The majority of these, say the authors, were Italians or southern Slavs of a low standard of culture, whose seamanship was not to be compared with that of German merchant officers. They brought into the navy the demoralizing influence of racial animosity, and, being generally suspected, they could not be trusted with important appointments. It is claimed, nevertheless, that regarded as a whole, the personnel of the "K. und K. Marine" did their duty in an exemplary fashion, and that the navy, down to the final débacle, was an intact, well-organized, and efficient striking force. "The personnel did everything possible to defend the coasts of the monarchy, and in general was imbued with a martial and enterprising spirit. In spite of difficulties arising from the conditions governing the personnel and of the fact that its ship material was far inferior in strength to that of any other Mediterranean power, the navy, thanks to its really good training, and not least to the devotion of its officers and men, was able to protect its own coastline all through the war, while making repeated attacks on the enemy's seaboard and assisting the land forces with such resources as it could spare."—*Naval and Military Record*, 1 March, 1922.

GERMAN MOTORSHIPS BUILDING.—Claiming that the accounts appearing in the daily and foreign press about the great number of motorships building in Germany are grossly exaggerated, a correspondent of *Hansa* asserts that the construction of only twenty-five such vessels of large type has been commenced in German yards since the beginning of 1919. These aggregate 120,000 gross tons and have all told engines of 55,000 horsepower.—*Nautical Gazette*, 4 March, 1922.

VESSELS REPURCHASED BY GERMANS FROM ALLIES.—The following is a partial list of the merchant ships which were surrendered by Germany to the Allies under the terms of the Versailles Peace Treaty and which have since been reacquired either by their former owners or other German shipping concerns:

Name	*Original Owner*	*Gross Tons*
Adler	North German Lloyd	1,304
Bagdad	German Levant	2,364
Cap Polonio	Hamburg So. Amer.	20,597
Claus Horn	Horn	4,174
Dora	H. Schuldt	2,662
Elbing	Ger. Australian	4,884
Erma Woermann	Woermann	5,528
Erika	Ozean	2,666
Florenz	Slomann	1,533
Fürst Bülow	Hamburg Amer.	7,638
Habsburg	Hamburg Amer.	6,437
Hannover	North German Lloyd	7,305
Hans Hemsoth	Hemsoth Reederei	2,487
Harald	Emden Reederei	1,866
Hedwig Heidmann	Hugo Stinnes	2,084
Helene	M. Jebsen	1,237
Henry Horn	H. C. Horn	1,287
Hersfeld	Cont.-Reederei	4,487
Ina Blumenthal	Joh. Blumenthal	2,229
Industria	W. Kunstmann	2,199
Isolde	Balt. Reed. A. G.	1,530
Kypros	Levant	2,210
La Plata	Hamburg Amer.	4,032
Lili Woermann	Woermann	2,283
Lisboa	Oldenburg-Port.	1,799
Lotte Reith	Reith	1,489
Martha Woermann	Woermann	2,282
Muansa	Ger. E. Africa	5,408
Munchen	North German Lloyd	18,000
Nitokris	Kosmos	6,150
Offenbach	Ger. Australian	4,336
Ostmark	Hamburg Amer.	4,399
Parma	F. Laeisz	3,091
Paula Blumberg	F. Laeisz	1,660
Peiho	F. Laeisz	2,118
Passat	Reed. F. Laeisz	3,091
Pinnas	Reed. F. Laeisz	1,946
Rabat	Hansa	4,678
Radames	Kosmos	4,756
Regina	W. Schuldt	1,297
Rhenania	W. Kunstmann	4,116
Reichenfels	Hansa	4,679
Roma	German Levant	2,606
Rudia	Hamburg Amer.	6,605
Rügen	Braülich	1,854
Santa Inés	Hamburg So. Amer.	5,199
Schwan	Argo	1,212
Schwarzenfelde	Fuhrmann	3,837
Schwinze	Bugs. Reed. Berg. Ges.	2,646
Seydlitz	North German Lloyd	8,008
Spezia	Hamburg Amer.	3,786
Svionio	Kunstmann	2,797
Tarpenbeck	Knöhr & Burchardt	2,118
Tucuman	Hamburg So. Amer.	4,702
Turpin	Roland	5,152
Volga	Neue Dampf. Co.	1,098
Wigbert	Hamb.-Bre. Africa	3,667
Woglinde	Cont.-Reederei	4,487
York	North German Lloyd	8,909
Total (59)		239,012

—*Nautical Gazette*, 25 March, 1922.

GREAT BRITAIN

REDUCTION OF THE NAVY.—A statement by the First Lord of the Admiralty explanatory of the navy estimates for 1922-23, was published on Monday in advance of the estimates themselves, which are shortly to be laid before Parliament. This document shows that very substantial reductions are to be made in naval expenditure during the coming financial year as a result of the Limitation Treaty entered into at Washington. It is appropriate that Lord Lee of Fareham, to whose efforts the success of the Conference was due in great measure, should be sponsor for the first navy estimates that reflect the decisions reached at that gathering. Some twelve months ago, shortly after taking up his appointment as First Lord, he expressed the hope that "as a result of frank and friendly discussion with the principal naval powers" it would be possible "to avoid anything approaching to competitive building, either now or in the future." As he observes in his present statement, "that anticipation has now been largely realised, and a new era of hope ushered in for an impoverished and war-weary world."

The reduction to be effected in naval disbursements during 1922-23 is shown by the following comparison with the estimates for the current fiscal year:

	Gross £	Net £
1921-22	91,554,869	82,479,000
1922-23	68,950,000 (approx.)	64,883,700
Reduction	£22,604,869	£17,595,300

The "one-power standard" of naval strength, which has been adopted by the government, connotes the maintenance of a navy not inferior in strength to that of any other power. According to Lord Lee, the Admiralty has not only framed its requirements in conformity with the new standard, but has gone further in accepting drastic economies, and consequent risks, which could only be justified on the assumption that the British fleet will not be engaged in any great war for many years to come. The Admiralty adds that on purely naval grounds such an assumption could not be justified, but as both the financial and the international situation call for an exceptional response, it has made it, realising, however, that in this matter a very grave responsibility is imposed upon it. The principal economies which it is proposed to effect may be summarised as follows:

(a) The scrapping of twelve capital ships, in addition to the eight recently sold for breaking up, and the maintenance of only fifteen in full commission, as compared with thirty-eight in March, 1914.

(b) Further reductions in the destroyer flotillas of the Atlantic fleet, involving the maintenance in full commission of only forty boats. One of the present flotillas is to be reduced to two-fifths complement, and twenty-three destroyers of the local defence flotillas are to be placed in reserve.

(c) Of the eighty-five submarines now on the Navy list, twenty-seven are to be scrapped. These latter, it is understood, comprise all the remaining *K* and *E* boats and most of the *R* class.

(d) The abolition of two of the Home Commands, viz., Coast of Scotland and Western Approaches.

(e) A reduction of the personnel of the fleet by more than 20,000 officers and men. In consequence of this very drastic cut it will be necessary to diminish the ship's company of each vessel of the Atlantic fleet by fifteen and seven-tenths per cent. The present complement per ship is

higher than the pre-war establishment, war experience having shown the desirability of increasing the number of officers and men borne in each vessel.

(f) The discharge of over 10,000 men from the royal dockyards, and a drastic reduction of civil staffs at the Admiralty and other establishments. Rosyth is the dockyard principally affected by this decision. In future it will be reserved for the docking of such ships as, by reason of their dimensions, cannot be docked at the southern yards, and for certain refitting work in connection with these vessels. Chatham and Pembroke are to be retained as royal yards—the first because it has small docks and storehouse accommodation with which the fleet cannot well dispense, and the second because its abolition would deprive the inhabitants of the town of Pembroke of their chief source of livelihood and thus create so much local distress that any direct saving in national expenditure would be more than neutralised by the necessity of granting relief. The Gibraltar yard is to be reduced, the annual saving at this establishment being estimated at £58,000. As the Admiralty points out these dockyard economies have been determined upon solely in the interests of national economy, and without regard to the requirements of the fleet. The result will be to delay and restrict a great deal of important ship construction and reconstruction, as well as repair and refitting work on vessels of the fleet. It is obvious that the plan of so enlarging the main slips at Portsmouth and Devonport as to enable those yards to undertake the building of post-war capital ships has been postponed indefinitely.

For the past month or two it had been persistently rumoured that the two new battleships which the Naval Limitation Treaty authorises this country to build would not be proceeded with. Fortunately, these rumours are now disproved, the First Lord stating that the vessels in question will be laid down early in 1923. The delay is probably due to the necessity of recasting their designs in harmony with the displacement limit of 35,000 tons specified by the Treaty. It is no longer a secret that the four battlecruisers authorized last year, but subsequently cancelled, were to have had a displacement of about 47,000 tons. In place, therefore, of the 188,000 tons of new construction contemplated last year, we are to build only 70,000 tons. Had the four battlecruisers been proceeded with the coming year's vote for contract shipbuilding would have amounted to £10,557,800, whereas it is actually limited to £300,000. This is, of course, the largest individual item of reduction directly attributable to the Washington Conference. Vote 9—Naval Armaments—shows a cut of £1,837,200 as compared with the last estimates. This money is to be saved by deferring the overhaul of and reconditioning of surplus stocks of ammunition, by keeping smaller reserves of mines and depth charges, and by delaying the issue of new armour-piercing shell. Economies of this kind would be inadmissible were the international situation less promising, but as it is they cannot be said to entail serious risk. Expenditure on naval works is to be reduced by £1,573,600, the Admiralty having arranged to proceed only with those undertakings the completion of which is either essential or would involve less outlay than the liquidation of the contracts. A further large saving is to be made in regard to oil fuel and coal, economies under this head reaching the impressive total of £5,386,500. It will mean cutting down the fleet's fuel allowance to the lowest possible limit, the laying up of several of royal fleet auxiliary ships normally employed on fleet fuelling duty, and the restriction by £500,000 of the development in 1922-23 of the Navy's oil fuel depôts at various bases abroad. The Lords of the Admiralty have not taken this step "without considerable anxiety, which will, they believe, be shared by all who realise the extent to which the mobility of the chief units of the British fleet is restricted under existing conditions, owing to the absence of the necessary oil-fuelling bases."

The votes for education and scientific services show between them a reduction of £122,000. The Admiralty—wisely, as we think—has declined to accept the drastic cut in expenditure on scientific and research work that the Geddes Report recommended. Such a measure would, it feels, "be inexcusable at a time when we are forced to rely more and more on the hope that the Navy will make up in quality of personnel and superiority of technique for the lead that has been surrendered in respect of matériel. Of all the lessons of the war, none stood out more clearly than the importance, and the previous inadequacy, of scientific research, and the Admiralty is convinced that the measures which it has taken are not more than sufficient to maintain research and experiment on a sound and at the same time very moderate and economical basis."

The foregoing review of the First Lord's statement shows that the Admiralty has made a determined attempt to cut down expenditure on the naval service. It is clear from his observations that further economies can be effected only at the cost of sacrificing efficiency to such an extent that the Navy would be no longer competent to carry out its duties in a national emergency.—*The Engineer,* 17 March, 1922.

NAVY ESTIMATES.—The navy estimates for 1922-23, "prepared on the assumption that the Naval Treaty concluded at Washington will be effectively ratified by all the signatory powers," amount to the grand total of £64,883,700, as compared with £82,247,900 for the current year.

The numbers provided for are: Officers, seamen, boys, and marines 118,500, and coastguard and marine police 2,900, but the first number, it is stated, will be reduced to approximately 98,500 as soon as practicable.

The votes for effective services total £54,774,200, a reduction of nearly £21,000,000, the result of the Washington Conference and concurrent administrative economies.

The non-effective votes have increased by £3,000,000, almost entirely due to provision for pensions and retiring gratuities to the great number of officers, men and dockyard employés (amounting to over 30,000), who are to be reduced this year.

It is stated that the King has approved of the giving up of the royal yacht *Alexandra* in order that the cost of her maintenance, about £26,000 a year, may be saved. The Admiralty yacht *Enchantress* is also being given up. Rosyth will be specially affected by dockyard reductions, as it has been decided to place this establishment on the footing of a docking yard. —*Naval and Military Record,* 15 March, 1922.

SUPER-HOODS TO BURN COAL.—It is reported that one of the features in the design of the two new battleships which are being laid down instead of the four super-*Hoods* is that they will be fitted to burn coal as well as oil. There is no intention, however, to banish oil fuel from the Navy altogether, and the ships will only use their coal for cruising at reasonable speed. When extreme speed is desired the oil-boilers will be lit up and the extra steam raised very much quicker than would be possible with coal.—*Engineering and Industrial Management,* 2 February, 1922.

DEFENCE MINISTRY SHELVED.—In view of the tremendous importance of the subject, the government have wisely decided to let the question of uniting the Navy, Army, and the Air Force under a Minister of Defence stand over for the time being. This announcement will be hailed with relief by the vast majority of those who take an intelligent interest in the welfare and efficiency of the fighting services. Except that now there are three distinct services to be considered instead of the two that were then in existence, the arguments which the Hartington Commission brought

forward against the creation of a Ministry of Defence are just as cogent and apposite today, as they were a generation ago. It was pointed out that while the position of the Minister of Defence would necessarily be a very powerful one, his decisions could never be final, since they would be liable to be overruled either by the Cabinet or the Prime Minister. Whatever its faults may be, the present system is based upon rational principles which, on the whole, have worked well in practice. It enables the Cabinet or the Prime Minister to hold the balance between the Admiralty and War Office claims on the one hand and financial exigencies, as represented by the Treasury, on the other.—*Naval and Military Record,* 15 March, 1922.

SALE OF IMPERIAL AIRSHIPS.—General regret has been caused by the announcement that in spite of the efforts made to utilise the existing British airships for experimental Empire services, or alternatively to employ the airships for test work and the accumulation of data on airship design and construction, the Air Ministry has decided to dispose of the existing fleet and material, together with certain airship stations. It is not believed that the disaster to the *Roma* has influenced this decision, which is based mainly on a desire of economy, and the inability of Dominion governments to co-operate in the proposed scheme for airship services. The airships which are to be offered for sale are the *R-80, R-33, R-36,* and the ex-German *L-77,* which are completed, and the partially built *R-37.* There is a considerable quantity of airship material, and the stations which will be included in the deal are those at Pulham and at Cardington, near Bedford. It is difficult to imagine where the Disposals Board will find purchasers in view of the failure of the home government to obtain the support of Dominion governments for restricted airship services, and it is probable that it will be necessary to look abroad for buyers.—*The Engineer,* 10 March, 1922.

SCRAPPING SUBMARINES.—There will not be much surprise in the Navy that the Admiralty have decided to scrap the Material Reserve of submarines, which is formed of almost the whole of the *E, G,* and *R* types. The fact that these craft were in the Material Reserve was indicative of their utility having come to an end, although this is not to say that the vessels were past service if they had been needed. The three *G* boats had been for some time on the disposal list, and were long ago regarded as of no further value; but the *E* and *R* submarines were all excellent craft, built during the war under the emergency war programme.

The *E* boats were a particularly fine type, and proved most satisfactory. They performed splendid work almost throughout the war, and their activities were so constant that no fewer than twenty-seven of them were lost in action. The thirteen vessels remaining, with the exception of one used as a target vessel with the Submarine School, are in the Material Reserve. The *R* boats were a product of the anti-U-boat compaign. They were all launched and finished in 1918, and were described as "submarine destroyers of submarines." Their outstanding features were their abnormal submerged endurance, and the very unusual quality of travelling faster below the water than on the surface.—*Naval and Military Record,* 8 March, 1922.

SWIMMING TESTS.—To standardise and improve existing instructions as regards swimming tests, a fleet order states, the following revised regulations are issued:

There will be two tests, viz.: Provisional test—to be carried out in a swimming bath. Standard test—to be carried out in the open sea. The

"provisional test" is only to be employed when open sea facilities are not available. In each case in order to pass the test every man is to swim forty yards in a duck suit in deep water after which he is to be able to keep himself afloat for three minutes.

Qualifications in both tests are to be awarded as follows: "Fair."—Meaning that the man only just managed to pass and should be given more practice. "Good."—An average swimmer. "Very Good."—A strong swimmer. These qualifications are intended to assist officers at sea to recognize backward swimmers.

Notations on service certificates are to be as follows: "Passed Provisional Test (P.P.T.)," followed by qualification and date; or "Passed Standard Test (P.S.T.)," followed by qualification and date; or "Cannot Swim," and date. Every effort is to be made to ensure that all officers and men pass the standard test.—*Naval and Military Record, 22* February, 1922.

A REDUCED FLAG LIST.—The announcement on Monday that the active list of flag officers in the Royal Navy is to be cut down from ninety-two to seventy-seven does not come as a surprise. The necessary steps to inaugurate the reduction will, it is understood, take effect in August. It is not yet clear whether this means that the total number of flag officers must come down to seventy-seven by that month, or whether a stop will then be made to promotions to flag rank until the list is down to the new establishment. The latter course would not be in the best interests of the Service, for it would have the effect of stagnating all promotions to rear-admiral for over twelve months, with corresponding influence on the lower grades. The better way, and the one which seems most likely to be adopted, would be for those officers whose prospects of employment are remote to retire voluntarily between now and August. Several admirals have since the armistice, shown their patriotism by retiring voluntarily in order to facilitate the promotion of those junior to them. If fifteen more were to do so now it would keep up the flow of promotion, and would relieve the Admiralty of the necessity for retiring compulsorily, by order in council, those officers who in August will be surplus to establishment.

The sequel to this cut in the admirals' list is no doubt being very fully considered by the Admiralty, for the problem in its relation to employment, retirement, the flow of promotion, and the age of officers is a very complex one. We are now getting back to the flag establishment of the early nineties, but whereas there were then only 168 captains and 236 commanders looking forward to promotion, there are now 356 captains and 557 commanders, or more than double the numbers. It is true that during the last twenty years the regulations for compulsory retirement for age and non-employment have been made more stringent, thus causing a greater flow of promotion to flag rank, but the effect of this will be neutralised when there are fewer vacancies to fill. We cannot afford, moreover, to retard advancements to rear-admiral, because the average age of the flag officers would soon become higher and higher, and we should be back in the bad old days when admirals never got their flags until they were fifty, and never handled a fleet until they were sixty. The circumstances of the moment seem to point to the necessity in the early future of a bold retirement scheme to clear the captains' and commanders' lists, and of a reduction of the ages at which flag officers must retire.—*Army, Navy, and Air Force Gazette,* 25 February, 1922.

AMOUNT REALIZED BY BRITAIN FROM SALE OF GERMAN SHIPS.—Lord Inchcape's report on the sale of former German ships on behalf of the

Allied reparations commission, made public in London last week, shows that 418 ships, aggregating 2,500,000 tons, were sold for £20,076,216 (normally $100,381,080). Expenses in connection with their sale amounted to twelve and one-half per cent.—*Nautical Gazette*, 11 March, 1922.

JAPAN

NAVAL BASES IN THE PACIFIC.—According to reports which have lately appeared both in American and Japanese newspapers, the closing stages of the negotiations at Washington were marked by acute differences of opinion with regard to the problem of fortifications in the Pacific. At one time, it is stated, the discussion threatened to end in a complete deadlock, which might have wrecked the whole scheme of naval limitation, for the American government attached particular importance to this question of fortified bases and felt that its settlement was a condition precedent to the maintenance of peace. A study of Article 19 of the Naval Treaty shows that a broad belt of the Pacific Ocean has been virtually neutralized by the agreement reached in respect of island fortifications. America has agreed not to proceed with defensive works at any point in her insular territories west of Hawaii, while Japan, on her part, promises to discontinue the erection of batteries and naval harbours at the outlying islands of her empire. The British Empire, also, pledges itself not to create any new fortifications in the Pacific except such as may be contemplated at points adjacent to the coasts of Canada, Australia, and New Zealand. Such, in broad outline, was the agreement reached after protracted and at times somewhat critical negotiations.

Japan, it seems, wished to exempt various islands of hers, particularly the Bonins and the Luchus, which, she contended, were so near to her coasts as almost to represent an interior line of defense. This may be true of the Luchu group, but it scarcely applies to the Bonins, which lie about 500 miles to the southeast of Japan proper. Nor is it easy to comprehend why Japan should have made such a point of excluding the Bonins, seeing that these islands are already well defended, the work having been completed only a few months since. It is not as though the agreement demanded the razing of defences already built; it merely provides that the *status quo*, at the signing of the treaty, is to be mainmained, so that even if the Bonins or any other islands embraced by the compact had just been equipped with forts and guns of the most modern and powerful type, there is nothing to prevent the maintenance of such works in a state of complete efficiency. It has been suggested in America that Japan's reluctance to accept this particular portion of the agreement was due not to any qualms about the safety of the Bonins or the Luchu Islands, but to an idea that she might eventually find it expedient to convert into naval bases one or more of the ex-German South Sea Islands, of which she is mandatory, and therefore desired to retain freedom of action in this matter. The American government, however, pointed out that, unless the *status quo* principle was accepted, they would have no alternative but to fortify the Philippine and other Western Pacific islands on a large scale, a step that would have brought the American fleet within easy striking distance of Japan, this being a contingency which the latter was, of course, most anxious to avert. This argument seems to have clinched the business, for Japan made no further objection to the fortification clause of the treaty.

It has since been suggested in the American Senate that Great Britain has gained an unfair advantage by the exclusion of Singapore from the non-fortification compact. A great naval base at this point would, it is asserted, enable the British fleet to dominate the waters of the Far East, and especially those areas from which the American Navy will henceforth

be cut off owing to lack of base facilities. Considering the almost identical aims of British and American policy in the Far East and the absence of any cause of friction between them, the strategic value of Singapore should be to Americans a matter of friendly interest rather than misgiving; but in any case there is no reason to suppose that this port will now be developed into a great naval station. As Mr. Hughes, the Australian Prime Minister, said recently, the question of providing a suitable base in the Pacific for the Imperial Navy was discussed at the Conference in London last summer, and a decision was then reached to establish such a base, but not at Singapore. The point actually selected has not been divulged, but, in view of the present shortage of money and the suspension of competitive shipbuilding it is most improbable that the project will materialize. We note that a Japanese paper, the *Mainichi*, professes to have discovered the venue of what would have been the British Empire's great naval station in the Pacific, namely, Geelvink Bay. The *Mainichi*, however, has overlooked the fact that Geelvink is situate, not in British territory at all, but in Dutch New Guinea. It is just possible that Japanese and American experts have exaggerated the importance of this question of naval bases in the Pacific. In that ocean of magnificent distances, fixed bases would doubtless play an important part in war, but there is nothing in naval history to justify the assumption that a large elaborately-equipped and well-defended harbour within the zone of operations is indispensable to the successful conduct of a campaign. It is a significant fact that in every naval war of modern times the victorious fleet had improvized its main war base, while the defeated side invariably operated from a large and well-nigh impregnable stronghold, furnished with every possible facility. Had the delegates at Washington been more familiar with naval history, it is doubtful whether they would have spent so much time in discussing a question which, after all, would probably prove to be of secondary importance in the event of war occurring in the Pacific.—*Naval and Military Record*, 15 March, 1922.

AEROPLANE MARKINGS IN JAPAN.—The mark of recognition for the aeroplane is a sun in red, displayed at each end of the upper surface of the upper wing and of the under surface of the lower wing, as well as on each side of the body (or on each side of the frame if the machine is of the frame system). The name of the aeroplane is displayed above the number on the rudder, and the number is displayed in Arabic figures on each side of the rudder, or on each outer side (if there are two or more rudders) and on the under surface of the lower wing with its head to the front.—*Aerial Age Weekly*, 13 March, 1922.

REDUCTION OF JAPANESE ARMAMENTS.—Reports just to hand indicate that as a result of the decision to reduce armaments, about 60,000 workers, including men employed in naval and military establishments, are to be discharged. The number of hands on the pay roll of the Japanese Imperial Dockyards is about 80,000, but it is hoped to find employment for a considerable percentage of them for some years in the breaking up of the warships, which are to be scrapped under the Washington agreement, and in the building of auxiliary vessels which are authorized by the naval pact.—*The Engineer*, 17 February, 1922.

N. Y. K. WITHDRAWS ITS BEST LINERS FROM SEATTLE RUN.—As a result of the competition of the Shipping Board's fast combination passenger and cargo carriers operated by the Admiral Line on the Seattle-Yokohama run, the Nippon Yusen Kaisha announces the withdrawal from that service of its 10,500-ton liners *Katori Maru*, *Kashima Maru*,

Suwa Maru, and *Fushimi Maru*. The withdrawn vessels will be employed on the European route and are to be replaced by the smaller 6,000-ton ships *Kaga Maru, Iyo Maru, Shidzuoka Maru*, and *Yokohama Maru*. The new schedule will go into effect in east-bound travel with the sailing of the *Kaga Maru* from Yokohama, March 17, and westbound with the sailing of the same ship from Seattle in May.

New minimum fares from Yokohama or return and to Hong Kong or return will range from $210 to $275 as compared with $300 and $375 on the larger vessels. This is a reduction of approximately thirty per cent.

According to an announcement from the Seattle office of the Nippon Yusen Kaisha, the 6,000-ton ships will ply in the Seattle-Oriental service only temporarily and are to be replaced by a new type of vessel especially designed for this service. These new ships will be larger, faster, and more luxurious than any steamers hertofore calling at Seattle.—*Nautical Gazette*, 4 March, 1922.

POLAND AND JAPAN LINE.—According to a Polish newspaper, the Nippon Yusen Kaisha contemplates establishing a regular shipping connection between Poland and Japan via Danzig. Toward the end of February, it is stated, the first shipment of Polish goods will be despatched to Japan, and in the event of the experiment proving successful a regular Danzig-Japan Line will be started.—*Nautical Gazette*, 25 March, 1922.

UNITED STATES

NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR
WASHINGTON, D. C.

March 10, 1922

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—Progress as of February 28, 1922

Type Number and Name	Contractor	Per Cent of Completion			
		March 1, 1922		Feb. 1, 1922	
		Total	On Ship	Total	On Ship
BATTLESHIPS (BB)					
45 *Colorado*	New York S. B. Cpn.	89.6	88.7	87.0	86.8
47 *Washington*	New York S. B. Cpn.	75.9	70.3	75.3	69.4
48 *West Virginia*	Newport News S. B. & D. D. Co.	74.	70.2	73.	69.2
49 *South Dakota*	New York Navy Yd.	38.5	31.6	38.5	31.6
50 *Indiana*	New York Navy Yd.	34.7	27.2	34.6	27.1
51 *Montana*	Mare Island Navy Yd.	27.6	19.	27.6	19.
52 *North Carolina*	Norfolk Navy Yd.	36.7	27.1	36.7	27.1
53 *Iowa*	Newport News S. B. & D. D. Co.	31.8	27.4	31.5	27.1
45 *Massachusetts*	Beth. S. B. Cpn. (Fore River)	11.	4.3	11.	4.3
BATTLECRUISERS (CC)					
1 *Lexington*	Beth. S. B. Cpn. (Fore River)	33.8	24.2	33.2	23.4
2 *Constellation*	Newport News S. B. & D. D. Co.	22.7	19.5	22.3	19.1
3 *Saratoga*	New York S. B. Cpn.	35.4	28.	33.7	26.7
4 *Ranger*	Newport News S. B. & D. D. Co.	4.	1.5	4.	1.5
5 *Constitution*	Philadelphia Navy Yd.	13.4	8.4	13.3	8.3
6 *United States*	Philadelphia Navy Yd.	12.1	7.1	12.	7.

SCOUT CRUISERS (LIGHT CRUISERS CL)					
4 *Omaha*	Todd D. D. & Const. Cpn.	99.2	94.7	99.2	94.3
5 *Milwaukee*	Todd D. D. & Const. Cpn.	99.2	87.	94.	86.5
6 *Cincinnati*	Todd D. D. & Const. Cpn.	88.1	81.8	88.	81.6
7 *Raleigh*	Beth. S. B. Cpn. (Fore River)	64.2	46.6	63.7	45.6
8 *Detroit*	Beth. S. B. Cpn. (Fore River)	81.	68.1	79.1	64.8
9 *Richmond*	Wm. Cramp & Sons Co.	87.	80.	85.	79.
10 *Concord*	Wm. Cramp & Sons Co.	83.	77.	82.	75.
11 *Trenton*	Wm. Cramp & Sons Co.	58.	46.	57.	46.
12 *Marblehead*	Wm. Cramp & Sons Co.	47.	33.	47.	33.
13 *Memphis*	Wm. Cramp & Sons Co.	40.	26.	40.	26.
AUXILIARIES					
Repair Ship No. 1, *Medusa* (AR1)	Puget Sd. Navy Yd.	77.6	69.8	75.9	66.6
Dest. Tender No. 3, *Dobbin* (AD3)	Phila. Navy Yd.	68.1	67.8	67.5	67.2
Dest. Tender No. 4, *Whitney* (AD4)	Boston Navy Yd.	50.9	42.1	49.6	40.4
Sub. Tender No. 3, *Holland* (AS3)	Puget Sd. Navy Yd.	21.5	5.5	21.5	5.5
PATROL VESSELS					
Gunboat No. 22, *Tulsa* (PG22)	Charleston Navy Yd.	72.3	60.	72.	59.
DESTROYERS					
*339 *Trever*	Mare Island Navy Yd.	99.8	99.8	99.6	99.6
340 *Perry*	Mare Island Navy Yd.	90.7	90.7	87.7	87.7
341 *Decatur*	Mare Island Navy Yd.	84.3	84.3	83.3	83.3

Destroyers authorized but not under construction or contract
(12) Nos. 348 to 359 inclusive.
*Ready for commissioning.

There are three fleet submarines and thirty-eight submarines under construction.

There are six fleet submarines and one submarine authorized but not under construction nor contract.

FINISH "WEST VIRGINIA" UNDER NAVAL TREATY.—Secretary Denby today ordered work on completion of the battleship *West Virginia*, building in the yards of the Newport News Shipbuilding and Dry Docks Company, resumed, that vessel having been selected for completion instead of the battleship *Washington*, under the terms of the Naval Limitation Treaty.

The special naval board found the *West Virginia* to be eighty per cent finished, as compared to the sixty-nine per cent completed status of the *Washington*. Work on the *Washington* in the yards of the New York Shipbuilding Company at Camden, N. J., will remain suspended, as is the case with other new battleships and battlecruisers which are slated to be scrapped or converted when the treaty has been ratified and ratifications have been formally exchanged.

The battleship *Colorado* and the *West Virginia* will be the vessels to be added to the fleet as the equivalent in the American Navy for Japan's retention of the battleship *Mutsu*.

The Navy Department has not reached a decision as yet as to which of the three battlecruisers nearest to completion are to be converted into airplane carriers.—*Philadelphia Public Ledger*, 17 March, 1922.

BACKS ARMY AND NAVY.—President Harding is confident that Congress will not enact legislation that will cripple either the United States Navy or the Army. This was made known at the White House following the cabinet meeting and a conference with Representatives Anthony of Kansas and Sisson of Mississippi (Democrat), members of the subcommittee

of the appropriations committee in charge of the army appropriation bill, and an earlier conference with General Pershing. Mr. Anthony, after his interview with the President, said that he believed the House committee would give very careful consideration to the views held by the President regarding reductions in the Army. The President had previously talked with members of the navy committee.

The President, it is said, feels that just at the moment the country, and its temper is reflected in Congress, is passing through the acute stage of a disposition to cut everything to pieces. Mr. Harding realizes that there is a strong and well justified sentiment in Congress to reduce expenditures for the Army and Navy, and he is in cordial sympathy with the disposition in that direction, but he does not approve of cutting appropriations to the point where the Navy and Army could not function properly. He has assumed that there will be further reductions made in the Army, but he would oppose any reduction that would bring the Army to less than 130,000 men until the national guard has reached the stage where it can be turned to in an emergency. Mr. Harding believes that while the whole world is passing through a stage of social and political unrest, the situation is hopeful, particularly in America. He does not believe, however, that the time has come when this country can regard itself as perfectly secure without armed forces.

In his recent address to the joint session of Congress he spoke of the merchant marine as the second line of defense, and while he does not desire to stress that viewpoint, he believes, it is understood, that if America had a well-established, reasonably swift fleet of merchant ships, it would be of very great advantage to our naval defense.

Both the President and the Secretary of the Navy, it is understood, are aware that there have been many extravagances as a result of the war. So many subsidiary vessels were built during the war that there has been a natural temptation to place them in commission upon completion, and there have been literally hundreds of destroyers that have been operated at a very great expense entirely unnecessarily.

That there will be numerous changes made in the Army personnel is regarded as inevitable. The administration's view, it is understood, is that as at present organized the army is somewhat topheavy in the matter of commissioned officers. So many promotions have been made that there are comparatively few men of the lower ranks left.

As for the Navy, it is thought that there will be a material reduction of the personnel, but the President has made it known that he is not in favor of a reduction below 80,000.—*Washington Post*, 4 March, 1922.

NAVY YARDS WOULD BE COSTLY REPAIR PLANTS.—In a circular to its members, the American Marine Association calls attention to the fact that the shipbuilding industry is being menaced by an attempt to enact legislation whereby the navy yards of the country will be permitted to bid against private shipyards for reconditioning government-owned merchant vessels.

If the contemplated action is taken, it means that private yards would get only the work that the Navy could not handle; because it would be a perfectly simple matter for the government to underbid any price submitted by any private yard. As is well known, government operations never have regard for all of the fixed overheads of a private corporation; while on the other hand it is an easy matter for any department to offset its operating losses through deficiency appropriations or transfer of funds from one account to another.

Thus a bid by a navy yard for the reconditioning or building of a ship would mean absolutely nothing except additional taxes to an ex-

tent far greater than the difference between the government bid and that of a privately-owned yard; because in no event would the actual work be done under government supervision at anything like the cost to a well-organized corporation.

Again, there is nothing in the argument advanced by some members of Congress, that if the government-owned vessels were to be reconditioned at the navy yards it would keep several thousand men at work who would otherwise become idle through the agreement to reduce and restrict the number of naval capital ships. It is true that if the government were to do the work more men would be employed than were the contract given to a private yard; but aside from that, it takes just so many men to do a given piece of work and it would simply mean that the workmen of one centre would suffer at the expense of those at another.—*Nautical Gazette*, 11 March, 1922.

BOARD REJECTS ALL BIDS.—The Shipping Board rejected on Monday all of the bids received for its 1,490 steel vessels recently announced for sale. Chairman Lasker said that bids were received for about 100 ships, which were so low as not to warrant serious consideration. He also characterized the bids as facetious.

"The results obtained by the advertisement proved conclusively," Mr. Lasker said, "that there is no market for shipping board vessels, even of the most approved types, at this time. Our reports would indicate that there is not more than $15,000,000 in the American market available for investment in ocean-going ships, where £45,000,000 is said to be available for a like purpose in the United Kingdom."—*Nautical Gazette*, 25 March, 1922.

"COLUMBIA" SOLD TO ADMIRAL LINE FOR $1,250,000.—The fast triple screw turbined passenger and cargo steamer *Columbia*, formerly the *Great Northern*, has been sold by the Shipping Board to the Admiral Line for $1,250,000. This is $250,000 more than the amount paid for the *Northern Pacific*, the sister ship of the *Columbia*, which was recently destroyed by fire. The fact that the Navy made improvements to the *Columbia* while it had the vessel in its service accounts for this increase in price. It is understood that the *Columbia* will be renamed *H. F. Alexander* and that she will be reconditioned at the yard of the Sun Shipbuilding Company, Chester, Pa.—*Nautical Gazette*, 11 March, 1922.

SEAGOING STEEL TONNAGE ACCORDING TO YARDS

Building or Contracted for in the United States, March 1, 1922

SHIPYARD	PRIVATE ACCOUNT		U.S.S.B. ACCOUNT		TOTAL	
	No.	Gross	No.	Gross	No.	Gross
Bethlehem S. B. Corp., Ltd.						
Balt. D. D. Plant	1	4,000	..	.....	1	4,000
Spar. Point Plant	2	27,000	1	10,500	3	37,500
Union Plant	2	27,000	..	.....	2	27,000
Federal S. B. Co.	1	6,000	..	.....	1	6,000
Hanlon D. D. and S. B. Co.	1	1,500	..	.....	1	1,500
Merchant S. B. Corp.	2	15,600	..	.....	2	15,600
New York S. B. Corp.	2	13,600	..	.....	2	13 600
Pusey and Jones Co.	2	5,420	..	.....	2	5,420
Sun S. B. Co.	1	9.000	..	.....	1	9,000
Total	14	109,120	1	10,500	15	119,620

—*Bulletin of the American Bureau of Shipping*, March-April, 1922.

FEBRUARY SHIPBUILDING OUTPUT IN DETAIL.—The Bureau of Navigation Department of Commerce, reports 39 sailing, steam, gas, and unrigged vessels of 28,359 gross tons built in the United States and officially numbered during the month of February, 1922, as follows:

	Atlantic and Gulf		Pacific		Great Lakes		Western Waters		Total	
	No.	Gross	No.	Gross	No.	Gross	No.	Gross	No.	Gross
WOOD										
Sailing	4	581	..	.....	..	.....	..	.....	4	581
Steam	..	.....	..	.....	..	.....	1	115	1	115
Gas	19	628	3	49	1	17	..	.....	23	694
Unrigged	2	1,137	1	271	..	8	..	.....	3	1,40
Total	25	2,346	4	320	1	17	1	115	31	2,798
METAL										
Sailing	..	.....	..	.....	..	.....	..	.....	..	.....
Steam	2	28,611	..	.....	..	.....	4	5,644	6	34,255
Gas	..	.....	..	.....	..	.....	..	.....	..	.....
Unrigged	..	.....	..	.....	..	.....	2	1,306	2	1,306
Total	2	28,611	..	.....	..	.....	6	6,950	8	35,561
TOTALS										
Sailing	4	581	..	.....	..	.....	..	.....	4	581
Steam	2	28,611	..	.....	..	.....	5	5,759	7	34,370
Gas	19	628	3	49	1	17	..	.....	23	694
Unrigged	2	1,137	1	271	..	.....	2	1,306	5	2,714
Grand Total	27	30,957	4	320	1	17	7	7,065	39	38,359

The above total includes 24 rigged vessels of 6,300 gross tons and 3 unrigged vessels of 1,960 gross tons, total 27 vessels of 8,260 gross tons built in years previous to 1922.

The largest vessels built during the month were the steel cargo carrier *Bethore* of 14,899 gross tons and the combination passenger and cargo carrier *Pan America* of 13,712 gross tons.—*Nautical Gazette*, 18 March, 1922.

PROPOSED U. S.-CHINESE S. S. CO.—It is reported from Washington that a new steamship company, financed by American-Chinese capital, is negotiating with the War Department for the purchase of the latter's surplus transports. The new company is said to be contemplating a service from Pacific Coast to Chinese ports, with feeder lines to the Straits Settlements, and to be figuring on the Army transports *Sheridan, Dix, Thomas, Sherman,* and *Logan*, which will soon be offered for sale.—*Nautical Gazette*, 18 March, 1922.

"GLORY OF THE SEAS" NO MORE.—The old clipper ship *Glory of the Seas*, which thirty-five years ago set a record for "windjammers" between San Francisco and Australia, is being broken up following the discovery that barnacles have eaten into her hull beyond repair.

The stout old ship was built at the famous Donald McKay yards in Boston, Mass., in 1869, and since then has called at most of the important ports of the world. One of her fast voyages was that made in 1875, from San Francisco to Sydney, N. S. W., in thirty-five days. Some years ago the *Glory of the Seas* was purchased by a Tacoma fish company and was put in the service between Puget Sound and Alaska. She is being broken up for what metal she holds.—*Nautical Gazette*, 11 March, 1922.

CONVERSION OF BATTLECRUISERS INTO AIRPLANE CARRIERS.—To insure to the United States the benefits conferred by Article IX of the Five-Power Naval Treaty, should that Treaty be ratified, Congressman Frederick

C. Hicks has introduced a bill, H. R. 10647, to authorize the conversion of two battlecruisers into airplane carriers. This highly desirable measure reads, in part, as follows: "The President of the United States is hereby authorized to undertake the conversion of any two thereof (battlecruisers of 1916 program) into airplane carriers within the limits of cost heretofore authorized for said battlecruisers." This permits the saving of two thirty-three-knot ships of about 33,000 tons each displacement, gives us two fast and serviceable carriers, and approximates the recommendation of the General Board for two large size carriers of sufficient speed to enable them to maintain their position in the advance scouting line of the fleet or in any position which strategy and tactics make necessary. And, too, the cost of the battlecruisers, as originally laid down, will equal approximately the estimated cost for the construction of new carriers of equal tonnage and speed—about $28,000,000 each. So much money already has been spent on these cruisers that the conversion will give us not only two desirable carriers but will save a sum estimated at $20,000,000. On the other hand, should the bill not become law, and the two cruisers therefore not be converted into carriers, the monetary loss will be the $30,000,000 already paid out or contracted for under the 1916 program, plus the cost for the two new carriers under the terms of the Five-Power Naval Treaty.

The crux of the whole matter is found in this phase of the Treaty: The United States is permitted to convert these two cruisers, which are of 43,500 tons displacement, into carriers of 33,000 tons displacement; but if this is not done we must content ourselves with new carriers of not more than 27,000 tons displacement. Also the two 33,000-tonners will accommodate eighty airplanes. The 27,000 tonners will not carry more than sixty planes.

Even the novice can see the desirability of this legislation. We save millions; we get two real carriers of size sufficient to make them formidable ships; we get them quickly; the money already has been appropriated under the 1916 program; we show ourselves to be squarely behind the Treaty; and we recognize the importance of aviation with the fleet. Without a preponderance of aviation no fleet can successfully meet an enemy so equipped.—*U. S. Air Service*, March, 1922.

SHIPPING SUBSIDY PROVISIONS OF NEW MERCHANT MARINE ACT SUMMARIZED.—President Harding's recommendations concerning the direct and indirect aids to be extended to our merchant marine have been embodied in a bill just introduced into Congress and which has been designated the "Merchant Marine Act, 1922." Section 701-703 of this measure provides for the granting of subsidies in varying amounts to American owners of every sail- or power-driven vessel of more than 1,500 gross tons and operated in the foreign trade, who elect to avail themselves of such compensation. For each 100 nautical miles traveled by such vessel, the subsidies payable are to be calculated on the following speed basis when on light draught:

Speed knots	Subsidy cents per gross ton
Under 13	.5
13 and over but under 14	.7
14 and over but under 15	.8
15 and over but under 16	.9
16 and over but under 17	1
17 and over but under 18	1.2
18 and over but under 19	1.4
19 and over but under 20	1.6
20 and over but under 21	1.8
21 and over but under 22	2
22 and over but under 23	2.3
23 or over	2.6

VESSELS UNDER 5,000 TONS

Power-driven vessels over 1,500 and less than 5,000 gross tons are to receive compensation as though they were in reality of 5,000 tons. The mileage upon which compensation shall be paid is to be determined, both for sailing and power-driven ships regardless of the vessel's log, according to a table of distances to be approved by the Shipping Board between the ports cleared and entered by such vessels.

Only vessels engaged in direct foreign trade, that is, where one of the ports is a port of the United States or of its possessions, shall be entitled to compensation, but vessels engaged in indirect foreign trades which shall transport passengers or freight to or from a port of the United States at least once a year are to receive compensation for mileage covered in such indirect foreign trade. Furthermore, American vessels operating between foreign ports primarily to gather cargo for delivery to home vessels engaged in the direct foreign trade and actually turning over one-half of the cargo handled by them to American ships in direct trades are likewise to be entitled to a subsidy.

Where a vessel is owned to the extent of a half or more by a single individual or corporation, no subsidy is to be allowed her unless one-third of her cargo-carrying capacity has been opened to engagement by independent shippers. This provision is clearly aimed to prevent vessels owned by great industrial companies, such as the Steel Corporation, from enjoying the benefits of the subsidy when they are engaged in carrying products exclusively for their owners.

Foreign Ships Barred

In order to guard against vessels under foreign flags being transferred to American registry for the purpose of enjoying the benefits of the proposed subsidy, the new act provides that no foreign built vessels shall be entitled to compensation after the date the act takes effect except in special cases where the Shipping Board passes a resolution permitting such foreign built vessel to receive the payments provided in the contemplated statute.

Another clause provides that no shipowner is to receive a subsidy three years after the passage of the act who is unable to show that seventy-five per cent or more of the total gross tonnage owned directly or indirectly or operated by him, whether as owner, charterer or agent in the foreign trade consists of vessels of American registry. This provision will affect concerns in the position of the International Mercantile Marine Company, the bulk of whose tonnage is under British registry.

Before becoming entitled to a subsidy, the owner of a vessel must enter into a ten-year contract with the government by which he binds himself to have all repairs to his vessels effected in an American port and to carry foreign mails from this country without compensation. If he lacks experience, means, or ability, the Shipping Board may decline to enter into a contract with him.

Should the Shipping Board in the case of an individual service decide that the compensation allowed by the act is insufficient, it may increase the sum awarded the vessel owner until it amounts to double the figures named in the statute. Conversely, if the Board is of the opinion that the amount of compensation awarded is excessive it may reduce the amount prescribed by law.

In another section, the wording of which is not exactly clear, the act provides that whenever an owner shall derive in any fiscal year from the operation of such of his vessels as are in receipt of a subsidy, a net operating income of more than ten per cent per annum, he must turn back

to the government one-half of all his earnings in excess of such ten per cent. According to Chairman Lasker of the Shipping Board, this ten per cent profit limitation clause applies to the owner's investment in each individual ship rather than to his fleet as a whole. The section means further that all earnings above ten per cent are to be split equally between the owner and the government subsidy fund, until the full amount of the subsidy has been repaid, after which the owner may retain all income. —*Nautical Gazette*, 11 March, 1922.

AERONAUTICS

WHY THE COUNCIL OF AMBASSADORS REFUSED AMERICA'S CLAIM FOR A NEW ZEPPELIN OF 100,000 CUBIC METERS.—Reports that commercial airships built or fabricated in Germany for America will be limited as to size, if permitted at all, which recently reached Washington from Berlin, have been characterized as doubtful by American air officers.

Basing their opinions on the fact that the recently concluded Arms Conference placed no limit on either size or type of aircraft, and on the specific authority of the Council of Ambassadors permitting the construction in Germany of a large commercial airship for the U. S. Navy, these officers point out that the interests of this country could only be obstructed intentionally by either Great Britain or France. The former might attempt to prevent the arrangement owing to national jealousy or for commercial reasons, and France because of a fear of aerial attacks from Germany if her airship industry is permitted to flourish, it was said.

One possible reason for objections on the part of Great Britain, is said to be that if she cannot control the air as well as the sea, she is loth to let America get started in lighter-than-air construction. England has still to hear from her dominions relative to their willingness to aid in the financial support of her contemplated "imperial airship scheme" which would link the mother country to their shores. Their replies are due next month, and it is believed that Australia, New Zealand and South Africa will agree to support the project, although Canada may not on account of the bad weather prevalent off her Atlantic coast.

The recent announcement from London that Great Britain has abandoned her airship project and that the rigid fleet with its accessories will soon be dismantled for want of a bidder is not credited in Washington, for it is pointed out that the final reply of the Dominions is still in abeyance.

The source of this report, which savors of propaganda, may be readily determined by a simple process of elimination, air officers believe. It is certainly not Germany, as that country, being the creator of the rigid airship industry, is anxious to preserve her pioneer position; France, though apprehensive of Germany in the air, could hardly suspect American aggression in the air, while if the United States did secure a couple of German ships, this would hardly keep the German interests active for more than a year or two; then too, they say despatches from Paris indicate that Americans there feel confident that no effort is being made to prevent the building of the American ship; Italy is not anxious about any possible attack from an American air armada; but in England, despite her previous assistance to this government in securing the permission of the Allied Council for the construction of a rigid in Germany, there lies a possible reason, it is said. Great Britain at one time wanted to take over the German airship works and operate them for the Allies, and she still has her lighter-than-air fleet, reports to the contrary notwithstanding. This fleet, though not in commission, is still held pending the decision of the Dominions as to future trans-oceanic airship lines. England, it is pointed out, is jealous of the remarkable growth of the French merchant

air fleet and also looks askance at recent developments which indicate American interest in commercial airship lines.

It is also to be noted that England has an air officer in Germany today. Air Commodore Masterman, R. A. F., who heads the Inter-Allied Aeronautical Commission in Berlin, from where the recent stories of limiting the size of America's Zeppelin and of possible prohibition on construction came.

The history of the German airship case goes back to the treaty of Versailles which provided that all German aircraft be turned over to the Allies. At the time there were fourteen large German rigids in existence. Seven ships were delivered; two each to England, France and Italy and one to Japan, but none to the United States. The remaining seven were in the meantime illegally destroyed in Germany. Following this action, the Allied Reparation Commission directed that Germany replace the destroyed ships by cash payment, or in kind if the Allied or Associated powers so desired. The commercial airships *Nordstern* and *Bodensee* were seized and turned over to France and Italy respectively, leaving five due from Germany. None of the Allies requested further ships, principally because of France's fear that if Germany were permitted to continue airship manufacture it would constitute a menace to her.

The United States was entitled to two airships, and it was her first choice, as France had received the *L-72*, and England the *L-71*, the two best and largest of the original German fleet. Only one ship was asked for by this government, however, when after the destruction of the *Z-R2* Great Britain was asked to assist America in securing a reparation ship of 100,000 cu. m. capacity. It is claimed that the Council, at England's request, ruled that any rigid airship of over 30,000 cu. m. capacity was a military ship and could not therefore be constructed in Germany, although British air experts had previously stated that an airship of less than 100,000 cu. m. was valueless as a commercial carrier. This discrepancy was pointed out to the Council, however, with the result that finally they permitted the United States to have constructed in Germany an airship of 70,000 cu. m. capacity, or about 2,450,000 cu. ft. of the *L-71* type, for commercial purposes. Today three naval air officers are en route to Berlin to supervise the laying out of the plans and the construction of this craft.

There was another difficulty to be surmounted in the securing of a rigid airship for the United States, on which the Secretary of the Navy made the following statement:

"It now appears that the valuation placed on the seven destroyed Zeppelins by a technical commission operating under authority of the Treaty of Versailles, which the United States was not a party to, was placed at so low a figure that a credit which the United States was assigned by the Allies on the reparations account to cover two destroyed ships is insufficient to cover what the Germans claim to be the cost of building one ship of a modern design under present conditions in Germany.

"The Navy Department has taken the position that no payment of money will be made to Germany for the one airship, and that the extremely low valuation placed upon destroyed ships by the Allies in 1919 and the high estimate now given by the German Government for a single replacement ship in 1922 must be reconciled. The State Department is now conducting negotiations with all parties interested in order to make it possible for the German government to proceed with the construction of an airship in accordance with the specifications of the Navy Department which is representing the Army and the Navy in this matter."

In consequence of the above stated concern demonstrated by British representatives in the efforts of this country to secure a large commercial airship, the attitude of the Allied Council, and the "no aerial-limitation"

policy adopted by the Arms Conference, American lighter-than-air experts are at a loss to understand why the subject of limiting the size of American airships, whether built or fabricated in Germany or not, is being agitated now.—*Aviation*, 27 March, 1922.

HELIUM PLANT CLOSED DOWN.—According to a special despatch to the *New York World*, the helium plant a few miles from Fort Worth built by the government at a cost of $7,000,000 to extract helium from the natural gas piped down from the Petrolia fields has been shut down because funds for its operation have been exhausted.—*Aerial Age Weekly*, 27 March, 1922.

HITCH IN ZEPPELIN DEAL.—The Navy Department has notified the State Department that it does not wish the German Zeppelin now being constructed for the United States by Germany under the reparations clause of the Versailles treaty unless it comes to America without cost.

The question has arisen as to whether the amount of money allotted for this purpose by the Allies under the reparations agreement to the United States was sufficient to complete the Zeppelin.

At the Army Air Service it was said that if the Navy refused to take the Zeppelin under additional cost that would not preclude the Army from taking her.—*Aerial Age Weekly*, 6 March, 1922.

A NEW GAS FOR AIRSHIPS.—Currenium is the name given a new gas for airships, which has been developed by Dr. Edward Curran, head of the reseach department of the International Transportation and Manufacturing Company, of Los Angeles, which controls the formula and all rights in the product. It is the result of several years' work by Dr. Curran, who is a chemist, and who produced the gas successfully in 1918. The company owning the formula is preparing to engage in the manufacture of the gas by an electrolytic process at a cost, it is estimated, about $100 per thousand cubic feet less than its costs to produce helium.—*Aerial Age Weekly*, 27 March, 1922.

THE "R-38" REPORT.—Two days after the loss of the *Roma*, the report was published of the Accidents Investigation Committee on the loss of the airship *R-38* at Hull on August 24 of last year. In general, the committee found that in order to fulfill the requirements laid down for the vessel the designers took risks by not availing themselves of the results of model experiments and by basing their calculations too extensively on the precedents set by earlier British designs of airships. The vessel as constructed failed to fulfil the prescribed requirements, and at the same time was structurally weak so far as manœuvring stresses were concerned. Professor Bairstow, a member of the committee, calculated that the factor of safety under aerodynamic loading conditions that were known to have occurred was not above two, and that under conditions that might easily have arisen it would not have been above one. The design, it would appear, was satisfactory from the point of view of the strength provided to resist the forces and moments arising from the buoyancy and the distribution of the weight; but, from the point of view of manœuvring stresses, it was defective. In this connection it is to be noted that the instability of the vessel was such that large movements of the control organs were necessary in order to hold her on any set course, and that she was fitted with specially powerful control surfaces of a new design. The material of which she was built was in general up to specification, although the committee found one or two weak members which, although they did not contribute to the disaster, were significant as indicating some lack of

supervision during the construction period. The vessel met with disaster when maneuvering at high speed simply and solely because the dynamic stresses added to the static were in excess of what her structure could support. As in the case of the *Roma,* defects of a serious nature developed in the vessel on flights preceding that on which the disaster occurred. On the third trial, for instance, disaster was narrowly averted by the prompt action of the commander in steadying the vessel and relieving the stresses on certain amidship girders which had failed when the speed was increased to 50 knots.—*Engineering,* 3 March, 1922.

THE "ROMA" DISASTER.—The *Roma* disaster, with its lamentable sacrifice of valuable lives, is the last bit of evidence that Congress should need in urging the necessity of appropriating sufficient funds to develop our supply of helium. It may be argued that the use of helium would not have saved the *Roma,* but the crowning horror of the airship's bursting into flames would by its use have been avoided. So much is apparent in advance of inquiry, which must be searching in vital details of construction and operation.

There is no parallel between the accident to the *R-38* and that to the *Roma,* for whereas the *R-38* collapsed on a test flight, the *Roma* had made scores of trips in Italy prior to its being brought to the United States, and on its first long trip from Langley Field to Washington, it made a very creditable showing.

The report of the investigating commission will be awaited with great interest.—*Aerial Age Weekly,* 6 March, 1922.

INFLAMMABILITY OF AIRSHIPS.—The *R-38* and *Roma* disasters, although due to different causes, naturally focus attention on the fire which was the one common element of both. In both cases the ships would have been complete wrecks without the fire, but with the loss of few, if any, lives. In neither case was there any explosion, except of gasoline tanks, but the extremely rapid spread of the flames left little chance for escape.

The most obvious remedy and perhaps the only one for small blimps is, of course, the use of helium gas. For larger ships, of say 1,000,000 cubic feet or more, there is another solution of the problem which seems to hold even better promise than helium. This is to make the envelope itself fireproof, which for all ordinary purposes would make hydrogen as safe as helium. Even a slow burning or so-called "flame-resisting" fabric would be immensely safer than the very inflammable materials used at present. Not only would they be more resistant to external ignition, but a hydrogen fire started would spread much more slowly.

In either case, helium or fireproof envelope, no aircraft will be entirely safe from fire until we have satisfactory heavy oil engines. It looks to us as if all three lines of development should be prosecuted with almost equal vigor, i. e., helium, fireproof envelope, and heavy fuel. Any two of these together should be sufficient to make an airship safe from fire.—*Aviation,* 13 March, 1922.

HELICOPTERS.—Experimental work carried out in France is giving definite results that offer at least some possibility of important developments in the future of aviation. The helicopter has always been regarded as an illusory application which may be perfect in principle but exceedingly difficult of realization, and while more or less successful attempts have been made to raise a machine vertically from the ground, most experimenters have found it difficult to make horizontal flights and to prevent the machine from rotating. M. Pescarra, an Italian engineer, has probably done more than anyone else in the way of obtaining practical results.

His helicopter was shown at the last aeronautical exhibition in Paris, and since then he has been developing his ideas with the aid of funds supplied by the French government, which is taking a keen interest in this new phase of aviation, as well as in everything else connected with aerial flight. The Pescarra apparatus weighs about 800 kilos. and is fitted with an engine of 180 horsepower, driving a number of horizontal propellers in opposite directions whereby the effects of rotation are eliminated, or at any rate considerably reduced. In preliminary trials carried out during the past month the machine repeatedly left the ground and was maintained for several minutes at a height of three feet or four feet, when the apparatus itself was almost stationary. While the trials are satisfactory so far as they have gone they are yet far from conclusive, but it is obvious that progress has been made with the helicopter, and its future will be looked forward to with interest, not less in this country, where Mr. Louis Brennan's machine is nearing completion, than in other lands.—*Engineering*, 13 March, 1922.

BRENNAN HELICOPTER LIFTS OFF.—Louis Brennan's experimental helicopter completed its first actual successful test at the Farnborough airdrome on February 9. Rising vertically from the ground and hovering in mid-air for some minutes, the helicopter landed lightly almost on the identical spot from which it rose.

The machine, weighing more than a ton, carrying a pilot and 250 pounds of excess weight was sent up secretly in a gyroscopic test.—*Aviation*, 27 March, 1922.

SPEED OF 312 MILES AN HOUR CLAIMED FOR A HELICOPTER.—An air journey from New York may be made in a single day, according to the remarkable claim made on behalf of Hansch helicopter, news of which has been received by the Air Ministry through unofficial channels.

The machine is the invention of a Dutchman. It is said to be capable of attaining a speed of 312 miles an hour, to be able to ascend and descend vertically or to remain stationary in the air over any given spot without the least danger of failing.

The news is the more interesting since the British Air Ministry intended, subject to Treasury sanction, to offer a prize of £50,000 for a practical design of a helicopter.—*Aerial Age Weekly*, 13 February, 1922.

ARMORED FIGHTING AIRPLANES.—In the paper on fighting airplanes read by Major Green before the Royal Aeronautical Society, which is reproduced in parts in this issue, the view is expressed that few fundamental changes will occur in this type of machine in the near future, say, within the next ten years. The lecturer is of the opinion that the principle improvements will consist in better performance and in an increased rate of fire for the guns, and that the specialized types for high altitude and low altitude work which were developed toward the end of the war will remain the main fighting craft of the air.

As Major Green says, it is very unsafe to predict the development of airplanes. However, it seems to us that the lecturer's views on the immediate development of the fighting or pursuit airplane are ultra-conservative, for they do not contemplate the possibility of a change in the strategy and tactics of air fighting.

What indeed is the present situation? Drawing on the naval simile, the pursuit airplane represents the capital ship of the air, if not in punishing power, then at least in its intent and function. That is, the pursuit airplane exists for the purpose of enabling one to establish aerial ascendancy, or mastery of the air, by sweeping the skies clear of enemy

pursuit airplanes and, as a secondary result, of observation and bombing airplanes as well.

Now, the pursuit airplane derives its offensive power from gun power and maneuverability, and not from gun power and protection, as the capitalship. The protection in the case of the pursuit airplane is entirely a function of its maneuverability, for given two airplanes of equal gun power but unequal maneuverability, the advantage will lie with the more maneuverable ship, all other things being equal. But the reason this is so is due to the fact that our capitalships of the air are highly vulnerable to gunfire provided it is possible to hit them. The question then arises whether there should not be developed a type of armored pursuit airplane endowed with a good performance, maneuverability, *and* range, which will be invulnerable to gunfire, or almost so. If such a ship had a performance and range slightly superior to that of observation and bombardment airplanes, and be just capable of outmaneuvering the latter types, there would become available an airplane which would actually fill the function of a capitalship of the air. Such an armored single seater could tackle any kind of military airplane, for, given equal gun power, the superior performance and maneuverability of the ordinary pursuit machine would be of little avail against the armor-plated "battle-plane," for the latter's superior range would enable it to "keep the air" while the pursuit plane would be forced down by lack of fuel, if for no other reason.

The development of such an armored battle plane is well within the present engineering possibilities. As a type, the cantilever metal monoplane is suggested, for it would permit of working the armor plating into the structure of the machine and so make it contribute to its strength, while on the other hand the cantilever monoplane does away with all those exposed vital parts (struts, wires, etc.) which when damaged may cause the machine to collapse.

We are fully aware that there are some serious objections to the use in warfare of such a machine; we nevertheless believe that the question should be gone into in detail if for no other reason than the possibility of some other air force tackling the question.—*Aviation*, 20 March, 1922.

ORDER FOR DOUGLAS TORPEDO PLANES.—Rear Admiral William A. Moffett, Chief of the Bureau of Naval Aeronautics, has placed with the Davis-Douglas Co. of Los Angeles an order for the construction of eighteen Douglas torpedo planes.

Contrary to a rumor current in the industry, this order was not placed with the Naval Aircraft Factory in Philadelphia, but the latter will build six Douglas bombers, while eighteen additional machines of this type will be constructed on competitive bids.—*Aviation*, 3 March, 1922.

NEW INVENTION IN AERIAL PHOTOGRAPHY.—A recent invention by F. M. Huddleston, Los Angeles, Calif., is creating considerable interest in aero-photographic circles. The Aerograph, as this invention is called, consists of a small pilot balloon from which is suspended a combination gyroscope and gimbal for holding the camera, together with electrical devices for controlling its operation. Absolute control is had from the base, which consists of a truck upon which is installed a winch and hydrogen generator, as well as a control board.—*Aviation*, 13 March, 1922.

NEW 1,000-HORSEPOWER AIRPLANE ENGINE WEIGHS ONLY 2,200 POUNDS.—A new ariplane engine which, though weighing only 2,200 pounds, develops 1,000 horsepower, has been constructed by D. Napier and Son, Ltd., of England.

This new engine is to be fitted to a specially designed airplane now being built for the British Air Ministry for coming trials. At the present time there are rumors that Prof. Hugo Junkers, of Germany, is building a huge monoplane which will carry four 1,000-horsepower. Junkers opposed piston-type Diesel oil engines.—*Power*, 7 March, 1922.

BRITISH SAFETY TANK COMPETITION.—A number of tanks entered into the safety tank competition organized by the British Air Ministry were recently tested at the Royal Aircraft Factory in Farnborough.

The Air Ministry offered prizes amounting to $10,000 for a tank which will not burst or leak and will be safe from penetration by bullets. Twenty-seven firms have entered, of which one is Italian, two French, one Japanese, one American and the rest British.

The rules of the competition provide that the tank shall weigh not more than one and three fourths pound per gallon. Among the other qualities insisted upon are lightness, durability, indifference to extremes of temperature and simplicity of construction.

Imitation "crashes" are realistically staged in the tests. Each competing tank, incased in a rough wooden fuselage, is attached to a lump of concrete weighing 600 pounds to represent the engine. The whole contraption is hauled to the top of a large balloon shed, about 100 feet high, then released and allowed to rush on wheels down a rail to smash into a bed of hard slate at the bottom. The tank descends at the rate of about 80 m.p.h. and reaches the bottom with a satisfactory thump.

Three kinds of shock-absorbing tanks have so far been tested. The first, manufactured by Beasley, Sims and Morris, consisted of three shells —an outer one of thin steel with a layer of rubber on the inside, then a steel with another layer of rubber, and, thirdly, the gasoline vessel itself, which is kept in position by shock-absorbing springs.

The second type, the invention of J. Gibson, is made on the bulkhead principle, the tank, shaped like a barrel, being made in three sections, the sections in front and behind the actual gasoline tank arranged to prevent damage to the gasoline tank itself.

The third tank sent in by the French firm of Bramson, is made of a rubber preparation with a sort of armoring of fine woven wire. This tank is mounted on rubber shock-absorbers, so that when it collides it bounces back like a ball.

No result will be reported until the tests are finished. Later the tanks will be fired upon by machine-guns at short range to test their capacity to remain gasoline-tight when penetrated by nickel or incendiary bullets. —*Aviation*, 20 March, 1922.

FLYING WEATHER FORECAST.—Arrangements have been made for the inclusion by the Weather Bureau of a *flying weather forecast* for zones 1 to 5, inclusive, for the period midnight to noon of the following day, in the *weather broadcast* from the naval radio station at Arlington, at 10 P. M. daily, commencing January 16, 1922.

The form of this forecast and the areas covered will be the same as that included in the morning *weather broadcast* from Arlington.—*Aerial Age Weekly*, 6 March, 1922.

SAFE FLYING IN FOG.—The very latest idea for flying is a wireless compass which can be set to any destination. The pilot will grope his way down to the airdrome by an arrangement of intersecting searchlight beams, the height of the point of intersection of the beams above the airdrome being known by the pilot. This is the idea of Sir Arthur Whitten Brown, navigator to the late Sir John Alcock on his trans-

Atlantic flight, who states that the wireless compass will be worked by directional wireless, the compass tuning in with a ground wireless station. Thus, if a pilot wants to fly from London to Paris, he sets the compass in tune with the Le Bourget (Paris) wireless station, and then he steers by this compass through the fog—or above it when possible—and he will find himself in due course over the Paris terminal.

In practically all fogs the airplane pilot finds clear weather before 1,000 feet up, and experiments have recently been conducted successfully at Croydon with an instrument for ascertaining the height of the fog. This instrument is sent up on a small balloon, and on it is a brass ring. As long as the instrument is in the damp fog the ring is held in position, but as soon as it gets above the fog into clear, dry air, the catch holding contracts and the ring slides down the string. The amount of string paid out is measured, and this gives the height of the fog. It is expected that by next year fog will not in any way interrupt the air liners. —*Aviation*, 13 March, 1922.

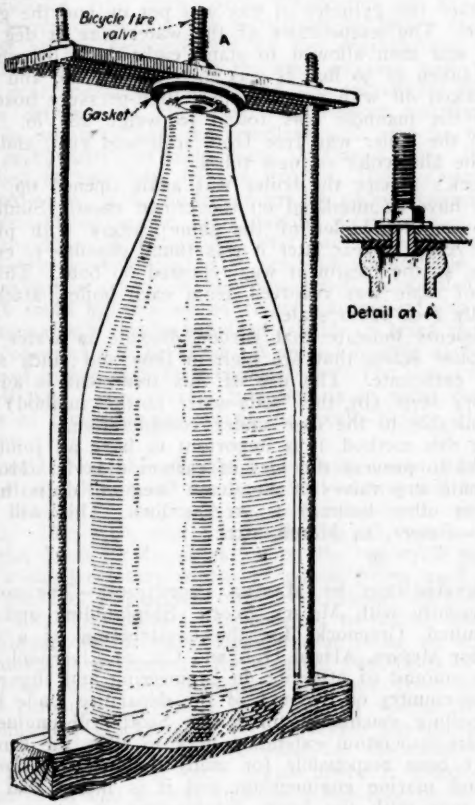
ENGINEERING

REMOVING BOILER SCALE WITH CO_2.—After trying to remove the scale accumulation from a battery of boilers by the usual method with little success, the authors decided to experiment with a solution of carbon dioxide in water. The success of the laboratory work and the subsequent tests on factory boilers led to a continuation of the investigation. While the experiments failed to develop a "cure all" for boiler troubles, the results presented in this report seem worthy of note as indicating what may be done in the case of certain troublesome scales. Fortunately it is easy for the engineer to find out whether this treatment will be successful for his particular conditions without going to the expense of making a trial with the actual boilers. The effect of the treatment on a given scale can be determined by the apparatus shown in the figure. This consists of a heavy soda-water bottle equipped with an ordinary bicycle tire valve. The method of clamping indicated insures a tight joint and at the same time permits the valve to be removed in order that scale or water may be placed in the bottle or withdrawn.

In testing, a few fragments of scale were placed in the bottle and covered with water. The bottle was then closed and charged from an ordinary carbonating apparatus such as is used in connection with soda fountains. The pressure regulator was set so as to give a pressure of 70 lb. per sq. in. The action on the scale was observed from time to time, but it was ordinarily several days before marked disintegration of the scale became apparent. Little was gained in any case by continuing the treatment more than a week or ten days.

Further details of the experimental work will be given near the end of the article. For practical power-plant work it is sufficient to know that if the scale shows marked disintegration in the bottle, it may be expected that the gas treatment in the boiler will produce the same result.

After preliminary tests with the bottle experiments were made on two horizontal-return-tubular boilers supplied with feed water containing about 7 grains of total solids per gallon. The chemical composition of the solids were as follows: Silicon dioxide (SiO_2), 56.1 per cent; ferric oxide and alumina (R_2O_3), 0.58 per cent; calcium oxide (CaO), 6.98 per cent; magnesium oxide (MgO), 3.98 per cent. The scale was the results of years of accumulation. It was hard and very adherent, so that the air hammer and other methods of scale removal had little effect on it.



Before trying the carbonated water, an attempt was made to remove the scale by the use of a solution of sal soda and lye. One hundred pounds of sal soda and seventy pounds of lye were put in the boiler. It was then filled with water to the normal level and kept boiling for a week. The removal of a small amount of recently formed scale was accomplished by this treatment, but when it was repeated, some weeks later, no scale was removed.

Before beginning the carbon-dioxide treatment the blowoff pipe from the boiler was connected with the suction of one of the feed-water pumps. This pump then functioned as a circulating pump, withdrawing water from the rear of the boiler and discharging it into the front end. The boiler was cut out of service and allowed to cool with all exits closed. This was done so that it would be filled with boiled water free from dissolved gases. Cooling was facilitated by fitting temporary con-

nections to several of the fire tubes and passing cold water through them.

Two cylinders of carbon dioxide, each containing about 50 lb. net, were emptied into the boiler through the discharge pipe from the circulating pump. The pressure gauge on the boiler then showed 37 lb. The next day another full cylinder of gas was put in, and the gauge showed 45 lb. pressure. The temperature of the water was 84 deg. F.

The boiler was then allowed to stand eight days, by which time the pressure had fallen to 30 lb. It was then opened up, and the softened scale was knocked off with water from a high-pressure hose. The scale raked out of the manhole was found to weigh 287 lb. Almost half the surface of the boiler was free from scale and rust, and the exposed surface had the blue color of new tubes.

After a week's service the boiler was again opened up, but no scale was found to have accumulated on the crown sheet. Similar treatment was given to another boiler of the same battery with practically the same results. About a year later it was found possible to cut the boilers out of service, so the treatment was repeated on both. This time, more than 100 lb. of scale was removed from each boiler, after which they were practically free from scale.

The experiments indicate that carbon dioxide in water is a solvent for certain boiler scales that are high in lime and silica and comparatively low in carbonate. The use of this treatment is advocated only after laboratory tests (by the "soda-water bottle" method) have shown that it is applicable to the case under consideration.

In applying this method, it is important to have all joints and valves absolutely tight to prevent the loss of carbon dioxide. However, small leaks in the main stop valves of the steam lines will do no harm if steam pressure (from other boilers) is on the line. This will prevent any outward leak.—*Power*, 14 March, 1922.

A NEW DEVELOPMENT IN MARINE PROPULSION.—The contract which was placed recently with Messrs. Scotts' Shipbuilding and Engineering Company, Limited, Greenock, for the construction of a 400-ft. twin-screw vessel for Messrs. Alfred Holt and Co., of Liverpool, has attached a considerable amount of attention in engineering and shipowning circles throughout the country on account of the departure made in connection with the propelling machinery for which Scott-Still engines have been adopted. In an association extending back to 1865, the firms of Scotts' and Holt have been responsible for many important advances in naval architecture and marine engineering, and it is fitting that they should be associated now with the latest development in marine propulsion.

The engines for the new vessel will be constructed under licence from the Still Engine Company, Limited, 7, Prince's Street, Westminster. It is gratifying to know that the Still engine is a purely British production in its inception and subsequent development. Scotts' Company directed their attention in 1916 to the slow-running merchant type of marine Still engine, and have designed and constructed an experimental single-cylinder unit of about 400 b.h.p., with which they have been carrying out an extensive series of trials at their works. The first of these trials was made in May, 1920. Following upon the trials made by French engineers, dealt with in our issue of September 2 last, Captain H. Riall Sankey, M.I.Mech.E., in October last conducted a series of trials, and his report, now available, is appended to this description of the machinery installation for the new Holt liner. The improvements introduced from time to time will be incorporated in the engines for the present contract.

The Scott-Still engines for the Holt vessel now ordered will have a combined brake horse-power of 2,500 when running at from 115 r.p.m., under ordinary service conditions. Each set of main engines will have four cylinders, 22 in. diameter, with a stroke of 36 in. The engines will be of enclosed type with forced lubrication to all the principal bearings. A group of pumps will be driven by levers and links from the crankshaft at the forward end of the engines, and will embody those required for the operation of the main engines, with the exception of the valve gear operating pumps, and the scavenging blowers which will be motor driven. All the usual engine-room auxiliaries, and the winches (11 in number) and the windlass will also be motor driven. The steering gear will be of Hele-Shaw Martineau type. Electric power will be supplied at 220 volts by two 160-kw. Diesel-driven generators, running at 250 r.p.m., and one generator of 50-kw. capacity driven by a Diesel or semi-Diesel engine. For starting these engines a compressor set will be provided. It is intended that one large generating set will supply the electric power required at sea and normally in port. When all the winches are in operation, the power will be supplemented by the 50-kw. set. A small lighting set of 12-kw. capacity at 110 volts, with a semi-Diesel engine, will also be provided capable of being started by hand, and a rotary converter will be fitted. A special feature of the installation is the absence of high-pressure air compressors. The thrust blocks will be of the Michell type. The present intention is to carry out a series of test-bed trials of the main engines at the works before fitting them on board the ship.

Some particulars of the characteristics and broad principles which have influenced the design of the Scott-Still engine will be of interest. The engines consist of an ingenious combination of oil engines and steam engines. The main source of power is oil consumed within the cylinder for the down stroke, operating on the two-cycle principle, while steam forms a supplementary source of power, being used upon the up-stroke. The oil fuel is injected into the cylinders without the use of high-pressure air. The engines are designed to reduce heat losses to a practical minimum, the primary consideration being to accomplish this in such a manner as to improve the thermal conditions of the working cylinders and so ensure the maximum efficiency from the fuel burnt therein. The combustion cylinder liners are of special form to secure immunity from heat cracks. On each cylinder top there is only one opening, and no separate cover is required for the combustion cylinder. Forming an integral part of each engine there is fitted a regenerator which is constructed like a small oil-fired water-tube boiler, and supplies steam for starting and manœuvring the engine. When the engine is started, the oil burners are shut off, and the regenerator then serves merely as a steam and water reservoir with which the water in the combustion cylinder jacket is in circuit. The heat from the jacket water, and that recovered from the exhaust gases through the medium of the regenerator and the feed heater incorporated therewith, all goes to form steam which performs useful work on the steam side of the engine pistons. The thermal working conditions of the cylinders result in the compression pressure being considerably less than in the ordinary Diesel type of engine. The valves on the steam side of the cylinders are operated by oil under pressure, which simplifies and facilitates the control of the engine for starting-up and while manœuvring. An impressive feature of the Scott-Still engine is the absence of the complicated array of rods, valves and cams associated with the ordinary Diesel engine. The results obtained from the experimental engine at Scotts' Works show that the Scott-Still engine has an advantage in fuel economy over

the best Diesel engine; but even more important, from the shipowner's point of view, is the fact that the space occupied by such an installation and the weight of machinery in sea-going trim are considerably less than with Diesel engines of the same power. It will be seen that the Scott-Still engines have many novel and attractive features, and the results of the new Holt vessel will be awaited with the greatest interest. —*Engineering*, 10 February, 1922.

TEST ON STILL STEAM-OIL ENGINE.—A test recently made on a Still steam-oil engine, conducted by H. R. Sankey as reported in *The Engineer*, is reproduced here. The Still engine used in the test is a one-cylinder unit. The upper end of the cylinder is the oil-burning portion, while the lower end under the piston is the steam cylinder. In the commercial units it is the intention to employ three cylinders arranged with

TABLE I

Dimensions of engine—	
Main cylinder:	
Stroke	36 in.
Bore	22 in. diam.
Piston rod	6¼ in. diam.
Auxiliary high-pressure cylinder:	
Stroke	22 in.
Bore	14 in. diam

	Over-load	Full Load	Three Quarter Load	Half Load
Maximum pressures in combustion cylinder, lb. sq. in.	615	595	600	585
Boiler pressures, lb. abs	114	112	111	111
Exhaust of engine (inches mercury)	26.5	26.9	26.8	25.9
Temperatures (deg. F.) Exhaust gases, boiler inlet	756	678	579	494
Feed water	78	76	79	78
Exhaust gases to atmosphere	156	164	181	181
Steam in boiler	347	346	345	345
Weight of steam passing through engine (pounds per hour)	1,025	892	583	355
M.e.p. referred to combustion cylinder—				
Combustion	89.53	81.37	71.27	56.63
Steam, high-pressure	5.10	3.86	2.07	1.12
Steam, low-pressure	6.46	6.14	4.75	2.72
Total	101.1	91.4	78.1	60.5
Revolutions per minute	129.3	125.0	111.3	97.4
I.h.p. combustion cylinder	400.5	351.5	274.1	190.6
I.h.p., total	451.7	394.7	300.3	208.5
Brake load (pounds)	1,500	1,380	1,125	830
Hp. absorbed brake	387.9	345.0	250.4	165.6
Brake efficiency, per cent	85.9	87.4	83.4	81.4
Hp. used in scavenging	20.7	17.7	13.5	6.5
Effective horsepower	367.2	327.3	236.9	159.1
Ratio, effective hp. to total i. hp., per cent	81.3	82.9	78.9	78.2
Total oil consumption per hour (pounds)	147.2	126.7	90.9	61.0
Oil consumption per combustion i. hp. per hour (pounds)	0.367	0.360	0.332	0.320
Oil consumption per effective hp. per hour (pounds)	0.401	0.387	0.384	0.383
Thermal efficiency i. hp. per cent	38.4	39.2	42.5	44.1
Thermal efficiency effective hp., per cent	35.2	36.4	36.7	36.8
B.t.u. per minute per i. hp.	110.4	108.2	99.8	96.2
B.t.u. per effective b. hp	120.6	116.4	115.5	115.2
Lubricating oil per hour, lb.	0.6	0.6	0.6	0.6
Smoke	Slight haze	None	None	None

one cylinder carrying high-pressure steam which exhaust into the other two cylinders. This gives three single-acting oil cylinders, one high-pressure and two low-pressure steam cylinders. In the experimental engine a separate steam engine was connected to the crankshaft to act as the high-pressure steam portion. This engine was jacketed by the exhaust gases from the oil cylinder, but not sufficiently to make it thermally as efficient as is to be expected in the commercial engine. The steam

supply is secured from the oil-engine jacket and exhaust supplemented by a separate boiler.

The essential results of the test are given in Tables I and II, while Table III shows the results to be expected from a three-cylinder engine.

Attention is called to the following facts brought out by the tests:

a. The remarkable fuel economy and the corresponding high thermal efficiency.

b. The small change in this economy from half to full load.

c. The capability of considerable overload at a comparatively small increase in fuel consumption per effective horsepower.

d. The high brake efficiency for a high-compression oil engine.

e. The low consumption of lubricating oil.

f. The low temperature of the exhaust gases on final discharge.

g. The entire absence of smoke, except a slight haze at overload.

At full load the indicated horsepower developed in the combustion cylinder was 351.5, the oil consumption was 126.7 lb. per hour, and since the lower calorific value of the oil was 18,053 b.t.u. per pound, the thermal efficiency was 39.2 per cent. The thermal efficiencies for the other loads are given in Table II.

These thermal efficiencies have been compared with those of an ideal oil engine working between the same temperature limits as the actual

TABLE II

	Over-load	Full Load	Three-Quarter Load	Half Load
Thermal efficiency of ideal engine	50.0	50.8	55.0	51.6
Thermal efficiency of actual engine	38.4	39.2	42.5	44.1
Efficiency ratio	76.8	77.2	83.3	85.4

engine at the various loads. The temperature limits have been obtained by the use of a temperature-entropy chart, and the thermal efficiencies calculated, taking account of the variation of specific heat.

At overload, 1,025 lb. per hour of steam (saturated) passed through the high-pressure and low-pressure cylinders. In the case of the high-pressure cylinder the indicated horsepower developed was 22.8, corresponding to a feed of 45 lb. per indicated horsepower hour. The admission pressure was 111 lb. abs. per in. and the exhaust 22 lb. absolute, and for these steam conditions the feed of the Rankine engine is 21.5 lb. per indicated horsepower-hour. Hence the efficiency ratio is 47.8 per cent, which is distinctly low for a high-pressure cylinder.

For the low-pressure cylinder the following are the corresponding figures: I.hp. developed, 28.9; feed, 35.5 per i.hp.-hour; Rankine feed, 17.1 lb. per i.hp.-hour; efficiency ratio, 48 per cent.

Usually, the efficiency ratio of the low-pressure cylinder of a condensing engine does not exceed 40 to 45 per cent, owing mainly to the loss caused by "cutting off the toe of the diagram." The higher value of 48 per cent in this case is due to the heat transmitted from the combustion cylinder.

It cannot be doubted that in the actual marine engine of the type which will be built for commercial use, where the high-pressure cylinder is at the bottom of a combustion cylinder, so that the steam receives heat during admission and expansion, the efficiency ratio of this high-pressure cylinder would be at least 90 per cent. As to the low-pressure cylinder, an efficiency ratio of 90 per cent can be expected if the back pressure be increased to the release pressure by passing its exhaust into

the low-pressure portion of a mixed-pressure turbine provided for driving the scavenge air blower. This turbine should be supplied with a small amount of steam direct from the boiler to make up the power required by the blower and for regulating purposes.

In the experimental engine tested, a certain amount of the exhaust gases was used for jacketing the high-pressure cylinder (auxiliary engine). In the three-cylinder unit this waste of exhaust gases would not occur and a corresponding additional weight of steam would be produced in the boiler.

The mechanical losses of the auxiliary steam engine were included when determining the horsepower absorbed by the brake, but in a three-cylinder unit they would not occur.

TABLE III—ECONOMICAL RESULTS THAT MAY BE EXPECTED IN A THREE-CYLINDER UNIT WHEN THE STEAM IS EXHAUSTED INTO A LOW-PRESSURE TURBINE DRIVING THE AIR SCAVENGE BLOWER

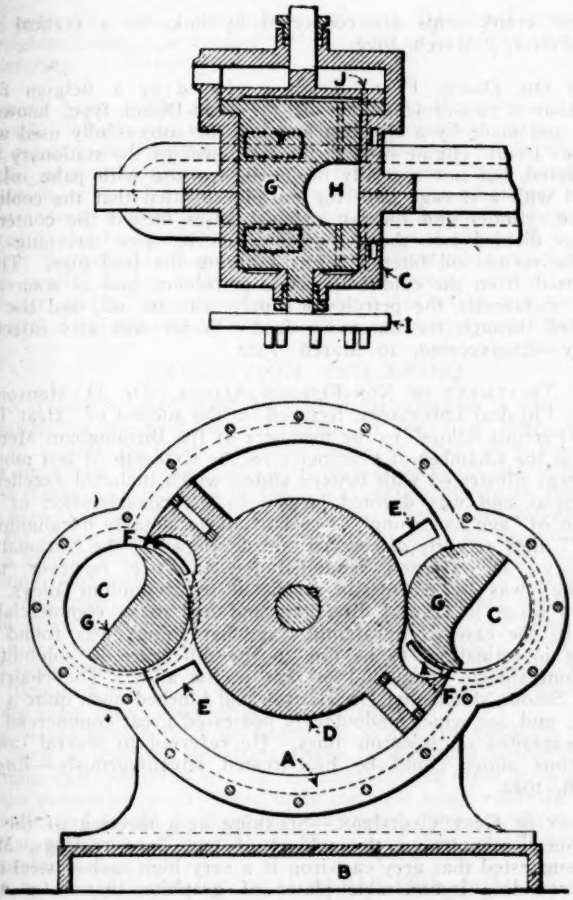
	Over-load	Full Load	Three-Quarter Load	Half Load
Total i.h.p.	463	404	302	206
Brake hp.	404	359	256	172
Brake efficiency, per cent	87.2	88.8	84.6	83.2
Oil per brake hp. (pounds per hour)	0.364	0.353	0.355	0.355
Thermal efficiency per brake hp., per cent	38.7	39.9	39.7	39.7
B.t.u. per minute per brake hp	109.6	106.3	106.8	106.8

The auxiliary engine is single-acting, and judging from general experience, its mechanical efficiency at 40 lb. m.e.p. would be about 90 per cent, which works out to a loss of horsepower equivalent to 0.0342 × revolutions per minute. Being a single-acting engine, the loss is practically constant at all loads, and this horsepower can therefore be added to the effective horsepower.

The calculations to ascertain what improvement in economy may be expected, based on the foregoing, are given in Table III.—*Power*, 28 March, 1922.

ROTARY STEAM ENGINE.—Patents have been issued to Albert C. Johnson, of Stillwater, Minn., covering improvements and modifications in the rotary steam engine. The sketch shows the engine as constructed. The cylinder *A* rests on the engine base *B* and has formed upon its opposite sides extension *C* constituting valve cages. The cylinder has projecting through it the axis or shaft of the rotor *D*, which carries two lugs containing packing rings. The central portion of the rotor is provided with concentric grooves opposite similar grooves in the ends of the cylinder, and these grooves co-operate to form traps for water condensation or oil, which will fill the grooves and serve as a seal for preventing leakage of compressions from the interior of the cylinder to the slight space around the shaft at the end.

Formed in one wall of the cylinder, adjacent to the cage *C*, are exhaust ports *E*, which lead to any suitable pipe or exhaust manifold. Inlet ports *F* are also formed in the walls of the cylinder. Within each of the valve cages *C* is a rotary valve *G*, supported on a stem that passes through one end of the cage. This valve has a portion *H* cut away, which permits of the passage of the rotor piston when in a certain position, and is provided at one end with a flange adapted to cover the adjacent inlet port *F*, and this flange is formed with a cutout portion of less length than the port *F*, but adapted to register at certain intervals. Carried on the stem of this valve is a disc *I*, having pin projections, which engages with an elliptical gear mounted on the end of the rotor.



JOHNSON ROTARY STEAM ENGINE

The number of the pins and teeth in the elliptical gear is such that as the rotor revolves the valve is also constrained to revolve. This admits steam through the port *F* into the cylinder behind the pistons of the rotor, and owing to the eccentricity of the series of pin teeth and the elliptical formation of the gear, it will be seen that the valve *G* will not rotate at a uniform speed, but will rotate very rapidly throughout a portion of a revolution and will have its movement retarded during the remainder of the revolution, this retardation being necessary to permit the passage of piston *D* through the cutout portion of the valve.

Inside each cage, engaging the flange of the valve, is a control disk *J*. This disk has a cut-out portion on its surface adapted to register with the cut-out portion of the steam-valve flange during the rotation of the valve, so as to control the admission of steam into the cylinder through the ports. Each disk carries a stem upon which is secured a crank arm,

and these crank arms are connected by links to a vertical governor shaft.—*Power*, 7 March, 1922.

PALM OIL DIESEL FUEL.—Trials conducted by a Belgian firm have shown that a two-cycle engine of the semi-Diesel type, known as the "Drott" and made by a Swedish firm, can be successfully used with palm oil. The "Drott" engine used in the trials was of the stationary type, and was adapted, but not specially designed, for use with palm oil. It was equipped with a storage tank for the oil, so fitted that the cooling water from the cylinder and the hot exhaust gases melted the contents. The tank was divided into three compartments by wire screenings, through which the melted oil filtered before entering the feed pipe. The engine was started from the cold with crude petroleum, and as soon as it was warmed sufficiently the petroleum supply was cut off, and the palm oil introduced through the automatic feed. Water was also injected automatically.—*Engineering*, 10 March, 1922.

HEAT TREATMENT OF NON-FERROUS ALLOYS.—Dr. D. Hanson, of the National Physical Laboratory, lectured on the subject of "Heat Treatment of Non-Ferrous Alloys" to the members of the Birmingham Metallurgical Society at the Chamber of Commerce on the sixteenth of last month. The lecture was illustrated with lantern slides, which included excellent micro-photographs and was devoted largely to the consideration of the phenomenon of "age hardening" of certain alloys, notably duralumin, and the new "Y" alloy recently discovered and developed at the National Physical Laboratory. Dr. Hanson reminded the audience, however, that "age hardening" was by no means restricted to aluminium alloys, but was found to occur in several directions and had many commercial applications. In the case of duralumin, "age hardening" was found on close scientific investigation, to be due to the difference in solubility of the magnesium silicide compound present in the alloy. The chairman, Mr. A. J. C. Smout, stated that Dr. Hanson had touched upon quite a new field of work, and one which undoubtedly possessed great commercial possibilities if exploited on scientific lines. He referred to several cases where non-ferrous alloys could be heat-treated advantageously.—*Engineering*, 3 March, 1922.

THEORY OF GREY CAST-IRON.—Speaking at a meeting of the Institute of Marine Engineers on the subject of grey iron castings, Mr. H. J. Young suggested that grey cast-iron is a very high carbon steel cut up by and surrounding innumerable plates of graphite, that is, a matrix of steel containing many spaces filled with graphite—for this reason can cast-iron be machined, the non-homogeneous material collapsing under the stresses produced by the edge of the cutting tool; for the same reason also has it little or no elongation and many other properties peculiar to itself. A practical object lesson of the truth of these things is obtained from a large propeller casting, blades and boss complete, and weighing, say eleven or more tons. Here the great mass of the boss causes extremely slow cooling of the adjacent parts, the effect getting less and less along the blades away from the boss and also the section of the blades themselves gets less. In practice, the molten metal flowing to the tips of the blades is almost chilled and, therefore, the tips are very hard and brittle and contain but little free carbon. A short distance from the tip this cooling is less severe and more carbon is released, with the consequence that the metal is grey but rather hard. Half-way up the blade the section is greater and the heat given off by the cooling of the boss delays the cooling, hence the metal will be very normal and perfectly grey and machinable. At the root of the blade, where it joins the boss, the cooling

will be extremely slow. The iron has time to free itself almost entirely from combined carbon, and when cold is found to be full of large graphite. —*Engineering*, 10 March, 1922.

"VIBRAC" STEEL.—The announcement is made that Messrs. Sir W. G. Armstrong, Whitworth and Co., Limited, following upon researches carried out at their Openshaw Works, Manchester, by Mr. H. H. Ashdown and other experimentalists, have discovered a new steel, styled "Vibrac" steel, which, it is claimed, gets over the temper-brittleness of nickel-chromium steels, a difficulty which has formed the subject of recent papers presented to the Iron and Steel Institute. In great masses it is said to be consistent throughout; it is also highly resistant to torsion and shock, qualities which render it very valuable for turbine motors and shafts, crankshafts, and all machinery component parts which are stressed to a high degree when running at high speeds.—*Engineering*, 24 February, 1922.

NAVIGATION AND RADIO

AIR NAVIGATION.—The most difficult of all problems in connection with "Navigation" is the provision of means in foggy or misty weather to enable an aircraft to locate the aerodrome for which it is bound and to make a successful landing to it. Professor Lindemann has suggested that the best means of landing in a fog might well prove to be the provision by the aerodrome so affected of two pairs of small kite balloons floating above the cloud layer, the first pair being at such an altitude as would enable a gliding machine, which passed between them, also to glide between the second, and lower pair, and after an equal interval of time to land on the aerodrome. In the case of thin fogs or ordinary mists it may be that the specially bright red ground flares which are now being tried will suffice. In heavy fogs there is always the possibility, given the right ground organization, of detecting the position of an aeroplane by sound and of signalling to it by wireless when to glide down and in what direction. This has been done successfully at Croydon.

Suggestions have been made to get rid of the fog either by mechanical means, such as pumping, or, alternatively, by electrical discharges, or even by burning vast quantities of coal or other fuel in order to warm the air above the saturation point; these three methods could easily be tried on a small scale, and would doubtlessly work; when, however, they are figured out for an aerodrome of normal size the cost of their introduction is found to be prohibitive.

It is a natural speculation as to what is likely to be the amount of deviation error in the magnetic compass when machines are built entirely of steel. Such tests as have already been made are, however, reassuring in this respect. It seems that the deviation error in any machine is largely dependent on the proximity of the engine, and that this effect predominates whether the framework is constructed of wood or of steel.

As regards navigation, either when flying over the sea out of sight of land, or when flying at any time above clouds, the necessary instruments to enable the position to be determined by the methods of nautical astronomy are now available. They have become sufficiently developed to enable the position to be obtained with a probable error of not over 10 miles. This is as high a standard of accuracy as is necessary for ordinary air work; it enables a check to be made on the dead reckoning course, and upon any determinations of position derived from wireless methods.

The study of directional wireless is being steadily pressed forward. A particularly promising form of it is the rotating wireless beacon; this method offers the very considerable bait of freedom from the troublesome quadrantal error, but it, like other wireless methods, depends for its ulti-

mate accuracy on a careful study of the conditions which determine the nature of the path followed by the waves.—*The Engineer,* 10 February, 1922.

BEST COLOR-BLINDNESS TEST FOR NAVIGATORS.—In a just published report, Dr. F. W. Edridge-Green, special examiner and adviser to the Board of Trade on Color-Vision and Eyesight, says that there is no universally recognized standard of rejection for color-blindness since the wool test has become obsolete. The wool test allows fifty per cent of dangerously color-blind to pass and of those rejected fifty per cent are not dangerously color-blind.

The nautical advisers of the Board of Trade are agreed that anyone who can distinguish between the red, green, and white lights at a distance of a mile has sufficiently good color perception for the purpose of navigation at sea. About twenty-five per cent of the men have diminished color perception and about five per cent will fail to distinguish between the red, green, and white lights of a properly constructed lantern or the actual lights themselves at a distance of a mile. These men may be ranged in three definite classes, the dichromic, who see only two colors in the spectrum, red and violet with a neutral division between them; the trichromic who sees only three colors in the spectrum, red, green, and violet, and who designate the yellow of the spectrum as red-green; and those who have shortening of the red end of the spectrum.

A person of very acute color-vision can distinguish seven colors in the solar spectrum, red, orange, yellow, green, blue, indigo, and violet. Those who have for all practical purposes normal color-vision, six, five or four colors, those who see six failing to distinguish indigo, those who see five, orange as well, and those who see four, blue in addition. Those who can distinguish seven colors are called heptachromic and those of less acute preception, in descending order, hexa-, penta-, tetra-, tri, and dichromic.

The tetrachromic, or those who see four colors in the spectrum, red, yellow, green, and violet, though in continual difficulty about blue and green, have a definite yellow sensation and repeated and extended examinations with actual lights extending in some cases over five hours have demonstrated that for practical purposes the tetrachromic are not dangerous. The possession of a definite yellow sensation is therefore the deciding point for passing as practically normal. The lantern is an efficient test, and enables cases of acquired color-blindness, as for instance those with central color scotoma, to be excluded as well as those due to defective light perception such as shortening of the red end of the spectrum.—*Nautical Gazette,* 18 March, 1922.

EMERGENCY SEAPLANE RADIO TRANSMITTER.—One of the greatest dangers to seaplanes flying over the ocean has been greatly lessened by recent radio developments by the Navy; namely, the emergency transmitting equipment now carried on multi-motored machines which permits the sending of radio messages when a plane has been forced to land on the water.

The recent forced landing of a seaplane off the Florida coast will serve well to illustrate the value of this development. Had a navy *F-5L* seaplane had such an accident, she could have sent a radio message immediately and assistance rushed to the plane. The plane could have been found more easily by the rescue vessel not only because her position was known, but also because the kite which is part of the equipment would be visible at greater distances than the plane on the water.

Formerly a plane could use its radio only while in the air where the antenna consisted of 200 or 300 feet of wire trailing behind the plane.

Of course, when the plane landed this antenna could no longer be used. A second antenna, however, was available on some planes, permanently rigged on the upper wing, but only very short ranges could be obtained on this "skid-fin antenna," about ten or fifteen miles. With the new apparatus the ranges obtainable on the water are in general twenty-five per cent greater than those in the air.

The equipment for this transmission is very simple, weighing only a few pounds. There are two kites, one for stronger and one for light breezes, and a reel of specially light antenna wire. When necessary to send a message from the water the radio generator is put in the wind stream of the good motor, if it were not there already, and the antenna wire flown from the appropriate kite. A canvas screen rigged in the wind stream concentrates its force on the wind-driven generator fan, so that, with the motor running slowly, the radio generator will develop full power for sending messages. This work has been done through the Bureau of Engineering by the Anacostia Air Station Radio laboratory. Commander Taylor and Lieut. C. D. Palmer have done most of the field and design work in this connection.

While the outfit was developed for multimotored seaplanes, its field of usefulness is much wider. To mention two other uses: A disabled plane, either sea or land plane, can increase its chances of being found by rescue planes by flying the kite, and with a small expeditionary force a plane so equipped might well be used for all communication.—*Aviation*, 27 March, 1922.

JAPANESE HIGH POWER STATION.—The January issue of the *Radio Review* contains some notes on the high-power radio station at Qwaki, near Tokyo, which was opened in March, 1921. The transmitting and receiving houses are about twenty miles apart, and the former contains arc and high-frequency alternator apparatus of 400 kilowatts capacity. The aerial, which is of the umbrella type, is supported by one main tower 656 feet high, which is a self-supporting reinforced concrete structure weighing about 11,000 tons. This tower is surrounded by eighteen masts 197 feet high, which are arranged in a circle round the central tower. The station is employed for duplex transmission, with the Hawaiian stations of the Radio Corporation of America, but it is intended to utilize it later for direct European traffic.—*Engineering*, 3 February, 1922.

RADIO SETS STANDARDIZED.—In standardizing specifications for radio apparatus in co-operation with the manufacturers the Bureau of Engineering, Navy Department, has effected a reduction in the price of various items used in radio sets at the present time. Aircraft and medium-range receiving sets, for instance, are reduced in price approximately sixty per cent, as are amplifiers, such as those used in receiving the large selection of lectures and concerns now broadcasted from many parts of the country. Detectors used in such receiving sets are now reduced some seventy-five per cent in price. Medium-size transmitting sets, both of the spark and arc type, are down on the average of thirty per cent, while various types of insulators in common use and necessary in assembling a radio set are reduced on the average twenty per cent.

Vacuum tubes for both transmitting and receiving sets, the latest thing in radio in common use, are down in price on the average about forty per cent. All this material is also improved in efficiency as well as reduced in price, the latest vacuum tubes, for instance, having over 1,000 per cent longer life than the early tubes possessed.—*Army and Navy Register*, 1 April, 1922.

WIRELESS TELEPHONE DEVELOPMENTS.—If statistics published in America this week can be accepted as an accurate representation of the position, there has been an extraordinary development of wireless telephony. It is said that the number of receiving sets in use increased in one year from 50,000 to 600,000. The usual plan is to install a small roof radial communicating with a simple receiving set, and plans are taking shape for the division of the country into definite areas for the distribution of wireless communication in the form of concerts, lectures and other public functions. The thing is becoming a craze with the American citizen, and, as might have been expected, it is being encouraged by a press which has an uncanny knack of gauging the selling value of news features.—*The Engineer*, 3 March, 1922.

SIMULTANEOUS TRANSMISSION.—Wireless Telephone and Telegraph Messages may now be transmitted simultaneously on the same wave length from a single transmitting set and antenna. This was demonstrated at the Engineering Societies Building, New York, by Dr. Frank B. Jewett, head of the Bell System Research Laboratories. The new achievement is made possible through an electrical "filter" invented by Dr. G. A. Campbell, which allows the separation of the "various frequencies at which individual telephone and telegraph messages are carried." In the demonstration, two such messages, dispatched at the same time, were received and were then detected by a single vacuum tube circuit. The detected current was then passed through the "filter" which distinguishes the telephone frequencies from those of the telegraph. According to its inventor, the filter differs from ordinary tuned circuits in that it separates not only single frequencies but bands of frequencies of pre-determined width.—*Tech Engineering News*, March, 1922.

RADIO INCIDENTS.—While the radio exhibition was in progress last week some remarkable demonstrations of "wireless" took place, although none of them figured in the official program. From his desk, General Manager Rossbottom of the United States Lines talked, through an ordinary telephone, with the master of the steamship *America*, over a hundred miles from port. The tragic side of wireless communication was represented by the story told by Captain Jorgenson of the Baltic American liner *Esthonia* which arrived in New York after passing through a succession of terrific storms on the mid-Atlantic. He described how the radio operator on the Norwegian steamer *Grantoft*, after sending out the calls for help, jested with his fellow operators while the vessel was sinking 700 miles off Cape Race, the final message indicating his approaching death and that of all on board. An element of comedy was provided by the announcement that a new feature of the reconditioned *Leviathan* will be a radio telephone equipment in each of the seven hundred first-class staterooms, thus destroying the last hopes of people who have hitherto sought rest and retirement by going to sea.—*Nautical Gazette*, 18 March, 1922.

ORDNANCE

A NEW FRENCH GUN.—During the month much interest was evinced in a new gun which is the invention of a French officer, Lieutenant Delamare-Maze. Experiments with the weapon have been in progress for some time, principally in Belgium, and next week some official trials of it are to be carried out at Liége under the auspices of the Belgian Government, which holds the Belgian license for the patent. Details of the invention, which, it is claimed, can be applied equally well to field and machine guns, as well as to rifles, have not at present been divulged; but it is claimed that as a result of its application the recoil is eliminated

and the speed of the projectile practically doubled. In past trials with a French "soixante quinze" it is stated that a muzzle velocity of 850 m.—say, 2789 feet—per second was obtained, the ordinary velocity being about 1740 feet per second. It is hoped, as a result of improvements since made, that a muzzle velocity of something approaching 3300 feet per second will be reached. The inventor asserts that with the recoil done away with it will be possible to build guns as powerful as those at present in existence at only a third of their weight.—*The Engineer*, 3 February, 1922.

AIRPLANE CANNON TESTS.—Recent tests indicate that the 3-inch or possibly the 5-inch cannon can be mounted on airplanes. At present the greatest difficulty seems to be in eliminating the destructive tendencies of the air blast from the cannon. A 2.95-inch cannon is now under test in a Martin Bomber. This is a modified mountain cannon and is mounted to fire downward from the airplane. A 3-inch non-recoil cannon has recently been mounted on the nose of an NSB-1 bomber and promises such success that plans for testing a 5-inch gun are under way.—*U. S. Air Service*, March, 1922.

NEW TEST OF THOMPSON SUBMACHINE GUN.—Another successful test of the Thompson submachine gun was completed recently, that conducted at the U. S. Bureau of Standards on March 20 and 21, under the supervision of the Aircraft Armament Board, the head of which is Major W. A. Borden, Army Ordnance Department. One of the officers present in an official capacity was Major M. F. Harmon, of the Army Air Service, with Mr. D. B. Gish, representing the Auto-Ordnance Corporation. The report was made by Major Borden. The latest test started by mounting the gun in the altitude chamber on an improvised mount at 8:30 A. M. on the twentieth instant. The temperature in the chamber was then reduced, and at 11 A. M. it was reported that the temperature had dropped to minus thirty degrees centigrade. At 1:56 P. M. the temperature was minus forty degrees centigrade. One burst of approximately five rounds was fired. At this point the wire connecting the trigger to the outside of the chamber broke. The chamber had to be entered, and it was found that the gun had jammed. Apparently the bolt in going forward had not shoved the round all the way home and had ridden up over the round. The jam was cleared by pulling the bolt back. Six bursts were then fired of approximately ten rounds each. Further firing was stopped at 2:03 P. M. The gun was left in the chamber at the reduced temperature, and at 3 P. M., with the temperature at minus thirty degrees centigrade, two bursts were fired, which completed the first 100 rounds. All firing was satisfactory with the exception of the one jam which occurred at the end of the first burst. The gun was reloaded and left in the chamber all night.

On March 21 at 11:30 A. M. the gun was again fired. During this firing the temperature was minus fifteen degrees centigrade, and the pressure inside the chamber was reduced to simulate an altitude of 24,500 feet. One burst of about ten rounds was fired, when a stoppage occurred. Investigation showed that the primer had misfired. The primer had been struck squarely and properly. The gun was reloaded by pulling the bolt back, and the second burst was fired, temperature minus thirteen degrees centigrade, altitude 24,500 feet. This burst was continued until all rounds were fired. This completed the firing of the second 100 rounds. Major Borden in his report of the test says: "The functioning of the gun was entirely satisfactory with the exception of the one jam reported in the first burst, fired March 20."—*Army and Navy Register*, 1 April, 1922.

MISCELLANEOUS

OIL IN GREAT BRITAIN.—The search for home oil fuel resources is not meeting with success. It was stated by the Secretary for Mines, in reply to a question in Parliament, that the only producing oil well at the present time is that at Hardstoft, in Derbyshire, from which the production for the six months ended December 31 last was no more than seventy-eight tons. The evidence so far obtained has not been sufficiently conclusive to enable the Minister to express an opinion as to the commercial possibilities of oil boring in Great Britain. It is, however, fairly clear that the hopes entertained at an earlier date that a successful industry might be established have been practically abandoned, and it is definitely announced that the government has no intention of introducing legislation to give the Crown any further rights or powers in respect of petroleum than it already possesses. An intimation has also been given that in exercising its powers under the Petroleum Production Act, the government will not interfere with the rights of private individuals further than may be necessary to prevent indiscriminate boring operations.—*The Engineer*, 10 March, 1922.

WAR OUTRAGE RECALLED.—An echo of the naval war comes from The Hague, where the International Commission of Inquiry into the loss of the Dutch steamship *Tubantia* has just announced its finding in the Permanent Arbitration Court. The *Tubantia*, it will be recalled, was a big ocean liner owned by the Royal Holland Lloyd. On March 16, 1916, while on a voyage from Amsterdam to Buenos Ayres, she was sunk by an explosion obviously caused by a torpedo. The only mystery about the business was whence the torpedo came. According to the British government, it was fired from a German submarine, but this was flatly denied by the Germans, who on their part declared the outrage to have been the work of a British submarine. This impudent falsehood was soon refuted, for not only was no British submarine anywhere near the scene at the time, but pieces of metal recovered from the wreckage of the *Tubantia* were identified as parts of a German torpedo.

In view of this damning evidence it is not surprising that the International Commission should have declared the *Tubantia* to have been destroyed by torpedo attack from a German submarine. Probably because the commission is composed of jurists belonging to states that were neutral in the war, it has qualified its verdict by stating that the question as to whether the vessel was sunk wilfully or as the result of a mistake by the German submarine commander must remain in dispute. On the other hand, it does emphatically reject the ingenious theory put forward from Berlin that the explosion may have resulted from the *Tubantia* having collided with a floating torpedo. That fairy tale was doubtless invented on the spur of the moment when the fragments of the torpedo were discovered to be of German origin. The world at large, remembering the hundreds of other neutral ships that were torpedoed by German submarines, will draw its own conclusions in this particular case, and doubtless number the *Tubantia* among the innumerable other vessels that were sunk at sight by the U-boat pirates.—*Naval and Military Record*, 8 March, 1922.

BREAKING STRENGTH OF MANILA.—From a series of 368 tests of Manila rope in sizes from one-half inch to four and one-half inches diameter carried out at the United States Bureau of Standards during the past three or four years it has been found that the average breaking strength of the rope is very closely represented by the formula $L = 5{,}000\ d\ (d + 1)$. —*The Engineer*, 10 February, 1922.

PORTUGAL'S STEPS TO SECURE NATIONAL MERCHANT FLEET.—The Portuguese government decree of November 22, 1921, which came into operation on January 1 last, has been a source of continual friction and disturbance ever since that date. The decree imposes enormously increased port dues and charges which might have been borne philosophically by the shipping community were it not that discrimination of a most unfair nature has been exercised against foreign and in favor of Portuguese vessels. The genesis of the enactment may be traced to the Portuguese ambition to establish a national merchant navy.

Although a qualified official denial has been issued of what is current knowledge abroad, there appears to be little doubt that the forty ex-German steamers which the Portuguese government seized and registered in its own name on joining the Allies in the Great War are to form the nucleus of the new Portuguese merchantile marine. It is freely rumored that a Portuguese company, furnished with German money, is to be established for the purpose of taking over these ships, and the scheme is inevitably linked with the name of Herr Hugo Stinnes. Be that as it may, it is significant of the trend of events that a direct line of steamers between Portugal and Germany, with an intermediate call at London, has already been inaugurated by a German company; and obviously, behind all these restrictive dues and port charges with their discrimination against foreign shipping, there is an idea that by such means Portugal hopes to regain to some degree at least, her old-time maritime pre-eminence.

The dues to be paid by foreign ship-owners have not only been increased four-fold, but they are first levied in Portuguese currency and then converted into sterling at pre-war or practically par rate of exchange. This sterling is next converted back to Portuguese currency at the present depreciated rate of exchange in which foreign shipping companies have to pay. The effect is, of course, that all shipping other than Portuguese pays over forty times as much as vessels flying the Portuguese flag. It may be argued that ship owners can recover from shippers and merchants the extra cost in port dues and charges, which amounts to 4s. or 5s. per ton, but when they attempt to do so they are immediately reminded by the merchants that such charges are not payable when the goods arrive in Portuguese bottoms and hence the money-saving tendency is to favor the shipment of cargo on national rather than on foreign ships.—*Nautical Gazette*, 11 March, 1920.

RUSSIA'S MERCHANT FLEET.—The Soviet government has recently published figures showing the size of the Russian merchant fleet on November 1 last and in 1913. Details are shown in the following table:

Sea	Steamers		Other vessels	
	1921	1913	1921	1913
Baltic	38	197	1	807
White Sea	21	48	350	485
Caspian Sea	165	259	185	545
Black Sea and Sea of Azov	49	379	254	750

Most of the ships belonging to the Russian volunteer fleet and to the Russian Navigation and Commerce Company are in foreign waters outside of the jurisdiction of the Soviet government. Steamers plying on rivers are only fifty-three per cent of their pre-war strength.—*Nautical Gazette*, 4 March, 1922.

SHANGHAI PORT IMPROVEMENTS.—Expenditure of $14,000,000 by China at the instance of five great governments to make Shanghai the greatest port in the world, is fore-shadowed in a report drawn up by an international commission appointed by the governments of the United States.

England, Japan, France, and Holland. General William Murray Black was the American member of the commission. They surveyed the entire port at Shanghai as a consultation board for the Chinese Republic.

That port is destined to be the greatest in the world, for nowhere else is there a seaport with a mighty river navigable for more than a thousand miles by vessels of 10,000 tons and under. Prominent in the project is the channeling of the famous bar at Woosung so that vessels of twenty-eight foot draft may pass up the Shanghai River. Levee work, riprap, and dredging are also provided for.—*Nautical Gazette*, 4 March, 1922.

CURRENT NAVAL AND PROFESSIONAL PAPERS

Washington and After—By Admiral Wester-Weymess, *Nineteenth Century*, March, 1922.

Civilized Warfare and Civil Engineers—*Nineteenth Century*, March, 1922.

Future Development of the Fighting Airplane—*Aviation*, 20 March, 1922.

Research With Full-Sized Airplanes—*The Tech Engineering News*, March, 1922.

The Past Year in Naval Aviation—*Aviation*, 20 March, 1922.

The Tactical Relations Between Different Classes of Men-of-War and Their Embodiment in Design (Abstract)—*The Shipbuilder*, March, 1922.

The Present Development of Reinforced Concrete Shipbuilding—*The Shipbuilder*, March, 1922.

The Still Engine for Marine Propulsion—*Engineering*, 3 March and 10 March, 1922.

Electric Propulsion of Ships—*The Shipbuilder*, March, 1922.

Will the Direct-Current Era Return?—*Scientific American*, April, 1922.

At the Sending End of Radio—*Scientific American*, April, 1922.

The First, and Last, 18-Inch Naval Gun—*Scientific American*, April, 1922.

American Warship Practice—*Engineering*, 17 March, 1922.

NOTES ON INTERNATIONAL AFFAIRS

FROM MARCH 5 TO APRIL 5

PREPARED BY

ALLEN WESTCOTT, Professor, U. S. Naval Academy

PACIFIC TREATIES RATIFIED

SENATE RATIFIES FOUR-POWER TREATY.—After extended debate the Four-Power Treaty regarding insular possessions in the Pacific was ratified by the U. S. Senate on March 27 by a vote of sixty-seven to twenty-seven, twelve Democrats and fifty-five Republicans supporting ratification. The treaty extends for ten years, and indefinitely thereafter unless terminated by any power upon twelve months' notice; it pledges the participating nations to a joint conference in case of difficulties arising among themselves, and to consultation as to proper measures in the event of aggression by another nation. Thirty-one amendments and reservations were rejected. Only one reservation was adopted, that proposed by Senator Brandegee reading as follows:

> The United States understands that under the statement in the preamble or under the terms of this treaty there is no commitment to armed force, no alliance, no obligation to join in any defense.

After ratification, the question was raised whether the supplementary agreement excluding the Japanese homeland should not have been ratified as a part of the original treaty. This difficulty was avoided by recalling the original treaty and ratifying both together. At this time the following reservation proposed by Senator Lodge was added to the resolution of ratification:

> Subject to the following reservation and understanding which is hereby made a part of and condition of this resolution of ratification, and which repeats the declaration of intent and understanding made by the representatives of the powers signatories of the Four-Power Treaty relating to their insular possessions and insular dominions in the Pacific Ocean:
>
> 1. That the Four-Power Treaty relating to Pacific possessions shall apply to the mandated islands in the Pacific Ocean; provided, however, that the making of this treaty shall not be deemed to be an assent on the part of the United States of America to the mandates and shall not preclude agreements between the United States of America and the mandatory powers respectively in relation to the mandated islands.
>
> 2. That the controversies to which the second paragraph of Article 1 of the Four-Power Treaty relating to Pacific possessions refers shall not be taken to embrace questions which according to principles of international law lie exclusively within the domestic jurisdiction of the respective powers.

ALLEGED AGREEMENT WITH ENGLAND.—During the discussion of the Four-Power Treaty Senator Borah raised the question whether there was not a secret unwritten understanding between the United States and Great Britain for mutual support in the Far East. He based his statement on a stenographic copy of remarks made by the New York lawyer, Paul D. Cravath, as follows:

Mr. Cravath—Now, to my mind a very important part of the achievement of the Washington conference is not recorded at all in black and white in that treaty, or in any of the other treaties that were negotiated, and that is the bringing about of what seems to be a sympathetic understanding between the United States and Great Britain regarding the Far East and Pacific questions generally. I quite agree that under the program produced by those treaties we have practically surrendered our naval position in the Pacific.

I assume that without further fortifications in the Pacific and that with the fleets and fortifications as agreed upon, we could not successfully compete with Japan in the Pacific alone, and certainly we could not compete with an Anglo-Japanese fleet in that region. On the other hand, and to my mind this is the much more encouraging statement based on the same facts, an Anglo-American fleet in the Pacific would dominate Japan, and it seems to me that we have substituted in place of the necessity for creating the greatest fleet the world has ever seen, with all the expense and temptation that involves, an understanding and basis for co-operation with Great Britain which gives these two powers the control of a combined fleet in the Pacific which will be large enough to dominate Japan and make her live up to the obligations she has assumed.

Mr. Davis—I want to know if you are making that statement as a fact, or is it just your own opinion of what would happen?

Mr. Cravath—I have been told by every member of the American delegation. I know definitely that the view is held by Mr. Balfour and I think by every other member of the British delegation, that the result of the conference has been not a formal agreement by any means, but an understanding, and such a degree of understanding and such a basis of sympathy has been created between Great Britain and the United States that both sides assume that in all future emergencies they can both count on having the very closest co-operation.

Mr. Davis—No, that isn't what I mean. What I mean is as to the agreements on fortifications and the Administration's naval ratio. Do you mean to say that both fleets would dominate the Japanese fleet?

Mr. Cravath—Of course, I have no independent knowledge of that. I am not a naval expert, and have no independent opinion on that point, but I am informed that our technical advisers are satisfied that if the United States and Great Britain are on one side, and Japan on the other, the Anglo-American fleet and the entire Anglo-American naval position would dominate that of Japan in Japanese waters.

As I say, I have no independent opinion of my own on that. I am simply repeating what I have been told in Washington.

But, in all events, we are mutually better off, if I am right in assuming that underlying sympathy with Great Britain, than we would have been with as large a fleet as the one we have had in contemplation and on our building program, being opposed with the largest fleet that Japan would find herself physically able to build, and Great Britain being bound, as a matter of course, to keep pace with both. So, assuming that our theory of Anglo-American co-operation is well grounded, it does seem to me that our naval position, as against Japan, has been improved rather than weakened, and we have the great advantage in the reduction of our naval program and all that that means financially and otherwise.

Mr. Cravath afterward issued a denial that he had cited the authority of the American delegates; and the American delegates and President Harding declared that no such understanding existed, and that it would be "perfidious" in view of the open agreements of the treaty.

OTHER TREATIES RATIFIED.—On March 29 the treaties for the limitation of naval armaments and regulation of the use of submarines and noxious gases in warfare were ratified by the Senate without reservation, the first by a vote of seventy-four to one and the second unanimously. Senator France of Maryland was the sole opponent of the naval treaty.

The two treaties relating to China were ratified on March 29. The treaty stating international policies regarding China was accepted unanimously, and the one providing for revision of Chinese customs received only one adverse vote, Senator King of Utah expressing the belief that it was unacceptable to the Chinese. Senator Underwood, defending these treaties, agreed there was no obligation to use force in case any party to the treaty should violate its obligations; but he insisted that the moral pressure of the other signatories upon the offending nation would carry great weight.

FRANCE MAY MODIFY TREATIES.—*Paris, March 27*—The treaty reservation habit is spreading. At the time they ratified the Treaty of Versailles the French did not know the game. It is different now.

Premier Poincaré intends, when he submits the Pacific treaty to the French Parliament, to accompany it with a reservation analogous to that adopted by the United States Senate. He regards it as fair that one party to a treaty should not assume obligations, implied or otherwise, which another signatory does not assume.

As for the naval treaty, the French executive will present it as signed. But members of the Chamber of Deputies will propose changes. I am informed that the following reservations or amendments may be offered:

First, an amendment changing the French capital ship ratio from 1.75 to 2.5.

Second, a reservation declaring that France deems that the treaty does not bar her from protecting her independence on land or sea.

Third, a reservation stating either that France retains the full right to decide what is a merchant ship, which under the Root plan must not be attacked by a submarine, or stating that France does not regard any vessel carrying guns as immune as a merchant ship.

The last named reservation, which will come from the Chamber's Naval Affairs Committee, has excellent prospects of being adopted. As for the other two, recognized as being basic in character because they mean changing the treaty terms, it is difficult to say at this time what support they will receive.—*New York Times*, 28 March, 1922.

GERMAN REPARATION PAYMENTS

REPARATIONS COMMISSION FIXES TERMS.—On March 22 the Allied Commission on Reparations, meeting in Paris, published its final proposals as to the amount to be paid by Germany during the year 1922, and the conditions to be fulfilled in view of the modified demands. The amount to be paid was fixed at $720,000,000 gold marks cash (of

which 280,000,000 have already been paid) and 1,450,000,000 marks gold value in materials. The German government was given until May 31 to accept the Allied demands, with warning that failure to do so would involve the penalties provided in the Versailles Treaty.

The more important additional demands were as follows: (1) Measures to prevent exportation of capital from Germany and to secure return of capital already sent out; (2) full independence of the Reichsbank; (3) imposition before April 30 of all the new taxes and reforms proposed by Germany last January, and further taxation to yield an additional revenue of 60,000,000,000 paper marks; (4) an internal loan in some other form than treasury bonds, to meet the present budget deficit. The question of a foreign loan was left to be dealt with later.

GERMANY DECLARES DEMANDS IMPOSSIBLE.—Speaking in the Reichstag on March 28, Chancellor Wirth declared that the German government would be unable to accept the demands of the Reparations Commission. He called attention in particular to the fact that the fall of German exchange as a result of the demands had at once added 28,000,000,000 marks to the German budget, and he considered utterly impossible the proposal for 60,000,000,000 paper marks of new taxes. In this position the government was supported by all parties in the Reichstag except the Communists.

In German circles the reparations demands were regarded as a victory for President Poincaré over the British. The hope was expressed that further negotiations might lead to acceptable modifications.

UNITED STATES DEMANDS SHARE OF OCCUPATIONS PAYMENTS.—When Allied finance Ministers met in Paris on March 8 to consider the allotment of payments made by Germany to cover the cost of armies of occupation, Secretary of State Hughes sent a note requesting that the American army costs, amounting to about 1,000,000,000 gold marks, should be taken into consideration. In reply it was suggested that the United States should take up the matter directly with the Allied governments.

Accordingly on March 20 Secretary Hughes sent identic notes to each of the Allies setting forth the right of the United States to share in occupation payments on an equal footing with the Allied nations that had signed the Treaty of Versailles. Secretary Hughes based his claim on the provisions of the German Armistice. He assumed that if any technical objection were raised, it must be on the ground that the United States had not ratified the Treaty of Versailles; but since Germany by separate treaty had expressly recognized the validity of the American claims, such technical objection must rest "solely upon the refusal of the governments of the Allied Powers themselves to permit the discharge of an admittedly equitable claim and thus to seek to maintain in their behalf exclusively a first charge upon the assets and revenues of the German Government."

FRENCH REPLY RECOGNIZES CLAIM.—At the close of March the French Government sent a preliminary reply to Secretary Hughes' note stating that the French government had never questioned the right of the United States to payment and expressing confidence that a satisfactory settlement would be reached regarding the method of collecting the amount due. It was stated that the Allies would soon make a common reply to the American note. Speaking in the French Parliament, Premier Poincaré pointed out that the only question at issue was whether the United States should collect through the Allies or directly from Germany.

RHINE TROOPS ORDERED HOME.—On March 20 the U. S. War Department announced the decision of President Harding to withdraw before July 1 all American forces in Germany. A previous reduction was ordered on February 16, so that on April 1 there were only about 2,000 American officers and men in the occupation forces.

AMERICAN AMBASSADOR TO GERMANY.—Alanson B. Houghton, appointed American Ambassador to Germany, sailed from New York on April 1. It was stated in Washington on March 28 that negotiations were in progress for a special treaty to adjust German and American claims growing out of the World War.

GENOA ECONOMIC CONFERENCE

PREPARATIONS FOR CONFERENCE.—Early in March the Italian government sent out invitations for the conference at Genoa to begin on April 10, the date agreed upon by the Allied premiers in their meeting at Cannes. It was expected that the conference might continue as long as three months, though a large part of this time would be taken up with committee work, while political leaders would not be present throughout.

Experts from the Allied nations met in London on March 20 to agree upon matters of policy and upon definite plans for concerted action in the conference. Among the problems considered was the regulation of credits to be apportioned to these countries offering adequate security.

UNITED STATES DECLINES TO TAKE PART.—In the following note to the Italian Ambassador, Secretary Hughes signified the unwillingness of the United States government to take part in the Genoa Conference. and at the same time expressed the attitude of this government toward the problems before the conference:

Washington, March 9.

Excellency:

I have the honor to acknowledge the receipt of Your Excellency's note transmitting the invitation addressed by the Italian Government to the Government of the United States to take part in an "economic and financial" conference to be convened at Genoa pursuant to the resolution

adopted on January 6, 1922, by the Allied governments in conference at Cannes.

I have also received your later notes with respect to American representation, the proposed agenda, and the postponement of the date of the conference.

Since the receipt of Your Excellency's first note the question of American participation in the proposed conference has had the most earnest attention. I am sure that you will realize that the Government of the United States must take a deep interest in any conference which holds promise of effective measures to promote the economic rehabilitation of Europe, since not only do we keenly desire the return of prosperity to the peoples who have suffered most severely from the wastes and dislocations of war but it is also manifest that there can be no improvement in world conditions in the absence of European recuperation. It is with this sympathetic spirit, and with the utmost reluctance to withhold its support from any appropriate effort to attain this object, that the Government of the United States has examined he resolution adopted at Cannes and the suggested agenda for the conference.

I regret to inform Your Excellency that, as a result of this examination, it has been found impossible to escape the conclusion that the proposed conference is not primarily an economic conference as questions appear to have been excluded from consideration without the satisfactory determination of which the chief causes of economic disturbance must continue to operate but is rather a conference of a political character in which the Government of the United States could not helpfully participate. This government cannot be unmindful of the clear conviction of the American people, while desirous, as has been abundantly demonstrated, suitably to assist in the recovery of the economic life of Europe, that they should not unnecessarily become involved in European political questions.

It may be added, with respect to Russia, that this government, anxious to do all in its power to promote the welfare of the Russian people, views with the most eager and friendly interest every step taken toward the restoration of economic conditions which will permit Russia to regain her productive power, but these conditions, in the view of this government, cannot be secured until adequate action is taken on the part of those chiefly responsible for Russia's present economic disorder.

It is also the view of this government—and it trusts that view is shared by the governments who have called the conference—that while awaiting the establishment of the essential bases of productivity in Russia, to which reference was made in the public declaration of this government on March 25, 1921, and without which this government believes all consideration of economic revival to be futile, nothing should be done looking to the obtaining of economic advantages in Russia which would impair the just opportunities of others, but that the resources of the Russian people should be free from exploitation and that fair and equal economic opportunity in their interest, as well as in the interest of all the powers, should be preserved.

While this government does not believe that it should participate in the proposed conference, it sincerely hopes that progress may be made in preparing the way for the eventual discussion and settlement of the fundamental economic and financial questions relating to European recuperation which press for solution.

Accept, Excellency, the renewed assurance of my highest consideration.

(Signed) CHARLES E. HUGHES.

His Excellency,
Senator Vittorio Rolandi Ricci,
Ambassador of Italy.

VOTE OF CONFIDENCE FOR LLOYD GEORGE.—On April 3 the British House of Commons supported Premier Lloyd George by a vote of 372 to 94 on the motion that "this House approve the resolutions passed by the Supreme Council at Cannes as the basis of the Genoa conference and will support His Majesty's Government in endeavoring to give effect to them." On the same date M. Poincaré was supported in the French Chamber by a vote of 484 to 78.

Speaking in the House on the motion quoted above, Premier Lloyd George outlined British policies for the conference, including restoration of trade, stabilization of exchange, reduction of land armaments, and limited recognition of Russia. On this last point he justified his policy by calling attention to the partial abandonment of communism in Russia, as shown by a speech of Lenine, and by citing the example of Pitt in dealing with revolutionary France.

STRUGGLE FOR RUSSIAN OIL FIELDS.—*Paris, March 15 (Special Cable).*—Undoubtedly a big struggle for the possession of the Caucasian oil fields is in preparation. The prospect of the conference at Genoa brought the matter to a head and at present great interest is taken in Caucasian naphtha by Russia, France, England, and America, or at least companies belonging to these various nationalities. The Standard Oil Company is naturally getting ready to put up a fight inside or outside the international gathering.

For the moment it is Royal Dutch, through the affiliated company Bataafsche Petroleum Maatschappy, which appears likely to obtain concessions which, according to the French, would constitute a monopoly. This Netherlands company is actually in negotiation with Soviet delegates, notably Leonid Krassin. But recent developments of Russian policy making for a repudiation of the method of parceling out the country make the situation doubtful.

As for the French, their view is simple. They are already at the mercy of great rival oil companies and have neglected to assure themselves of the oil sources in the world. They are opposed to any British monopoly and would be opposed to any American monopoly. They will not be left out of the Caucasus. At the meeting of experts in London next week this problem will probably be the chief problem, though it will not be treated with publicity. Should there be any secret agreement, France will consider that her interests have been jeopardized.—*Christian Science Monitor,* 16 March, 1922.

LEAGUE NOT TO TAKE PART AT GENOA.—*Paris, March 28 (By the Associated Press).*—The chances of the League of Nations' participating in the Genoa conference were reduced to a minimum today by the action of the Council of the League in simply referring to the general secretary Italy's invitation to send to Genoa technical experts from the League organization for consultative purposes.

It is known that Sir Eric Drummond, the League's general secretary, regards such partial and vague participation as is proposed in the invitation beneath the dignity of the League, and it appears probable he will find it inadvisable to take the League's technical men away from the work they are already engaged upon.

The Council today increased the membership of the mixed committee on disarmament, adding Lord Robert Cecil of England, Gustave Ador, former President of Switzerland; Francisco Nitti, formerly Premier of

Italy; M. Lebrun, formerly French Minister of Marine; Señor Gonzales Hontoria, formerly Spanish Minister of Foreign Affairs; and Señor Urrutia, Colombian Minister to Switzerland, and Prince Sapieha, formerly Polish Foreign Minister. This step was in response to a resolution passed by the committee on disarmament at its last meeting in Paris to the effect that the committee should be strengthened.

The Council also urged the committee to resume as soon as possible the active work of preparing a basis for the general disarmament plan which the Council will submit to the Assembly of the League next September.

SMALLER STATES AT GENOA.—*London, March 17 (Special Cable).*—The conference of Little Entente and Polish statesmen at Belgrade has concluded and a program has been agreed upon for presentation at Genoa. The Cannes proposals are to be adhered to generally and the common line of economic action agreed upon is intended to facilitate international trade, while leaving each state completely free politically. No state will interest itself in any question not directly affecting itself.

The Tzech legation here points out that the Belgrade agreement, contrary to report, does not constitute an alliance with Poland. The existing military alliance between Poland and Rumania in no way commits the little entente any more than the proposed Finnish-Polish military alliance will compromise the Baltic entente.

A conference of the latter states and Poland is to take place within a few days at Warsaw, when the Belgrade program will be proposed by the Polish representative for acceptance. If agreed upon, as expected, a powerful group will be formed that can act in conjunction with the allied group of Italy, France and Great Britain for the common good of Russia.—*Christian Science Monitor,* 18 March, 1922.

NEAR EAST

ARMISTICE FOR GREEKS AND TURKS.—On March 22 the Allied Foreign Ministers, meeting in Paris to reach a settlement in the Near East, sent telegrams to Constantinople, Angora, and Athens proposing a three-months' armistice between Greek and Turkish forces, with a ten-kilometer zone between the two lines, and with the promise of ultimate Greek evacuation of Asia Minor. Both the Greek and the Constantinople governments accepted this proposal, the latter on the condition that the term of the armistice be limited to one month. Up to April 5, however, the Angora government had accepted only "in principle," and there appeared little prospect that it would submit unconditionally to the terms proposed by the western powers.

PROPOSED PEACE TERMS.—Forced to recognize the break-down of the Sévres Treaty and the failure of the Greek offensive in Asia Minor, the Allied Foreign Ministers at the close of March presented a solution of the Near Eastern question on terms far more favorable to Turkey than had previously been proposed. These terms were submitted to the Greek and Turkish governments with three weeks for consideration and reply. The chief features of the Allied proposals were as follows:

(1) Perpetual freedom of navigation in the Dardanelles and Bosphorus, with international control of the straits under the supervision

of the League of Nations, and the Greeks in possession of the Gallipoli peninsula.

(2) Turkish sovereignty throughout Asia Minor, while France and Great Britain retain all the former Turkish territory in Syria, Palestine, and Mesoptamia at present under their mandates.

(3) Smyrna to be evacuated by the Greeks, but with adequate protection for Greeks in the city proper.

(4) Armenia to be under Turkish sovereignty, but with the population under the protection of the League of Nations.

(5) Turkish control of Constantinople and an extension of her boundaries westward, though Greece holds Adreanople, the Gallipoli peninsula, and a part of Thrace.

INDIA SUPPORTS TURKISH CLAIMS.—A sensation was caused in England by the publication of a despatch from the Government of India to Edwin Montague, Secretary of State for India, urging the need of a revision of the Sévres Treaty favorable to Turkey, as a means of placating Mohammedan feeling in India. The publication of this despatch, without consultation with other members of the British Cabinet, resulted in Mr. Montague's forced resignation. While the note itself was not resented, its publication in this manner was regarded as an effort on the part of one dominion to dictate the foreign policy of the British Empire.

EGYPT AN INDEPENDENT KINGDOM.—On March 15 Sultan Ahmed Fuad Pasha assumed the new title of "King of Egypt," and issued a proclamation declaring the end of the British protectorate. Great Britain, however, retains control of Egyptian foreign relations, and reserves the power to protect British communications in Egypt, defend Egypt against foreign aggression direct or indirect, and guard foreign communities and interests, in the country.

ITALY

FIUME PROBLEM UNSOLVED.—Following the overthrow of President Zanelli in Fiume, the Jugo-Slav government on March 6 despatched a protest to Italy. The Italian government had already sent representatives to the city and assumed temporary control, forcing the resignation of Signor Giuriati, d' Annunzio's former chief of cabinet, who had taken charge of affairs. In reopening the Italian Parliament on March 16 Premier Facta emphasized his desire to carry out loyally the terms of the Rapallo Treaty. Up to the close of March, however, no solution of the Fiume problem had been reached. Zanelli at this time was in Jugo-Slav territory near the city with thirty-six members of the Fiume Assembly, the majority of which insisted upon his restoration.

GREAT BRITAIN AND IRELAND

COMPACT BETWEEN ULSTER AND IRISH FREE STATE.—Following increased religious and partisan warfare in Belfast city and along the Ulster

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boundary, the political leaders of both Ulster and the Free State agreed to a meeting with members of the British Cabinet in London on March 29-30. At this meeting a compact was signed embodying in brief the following terms: (1) A declaration of peace and pledge of co-operation to restore peace in disturbed districts; (2) organization of special police in mixed districts of Belfast, to consist half of Protestants and half of Catholics; (3) trials for serious crime in Northern Ireland, if so requested by either the accused or the prosecution, to be before two judges with no jury; (4) a committee of inquiry in Belfast, half Protestant and half Catholic, with an independent chairman; (5) another meeting, during the month after Free State has ratified its constitution, to consider the possibility of Irish union, or, failing this, a settlement of the boundary problem; (6) the British Government to submit to Parliament a bill providing £500,000 for relief work in Northern Ireland, to be distributed one-third to Catholics and two-thirds to Protestants, the Northern government endeavoring to secure the restoration of expelled Catholic workers; (7) release of political prisoners, and avoidance of inflammatory speeches.

BRITISH PARLIAMENT RATIFIES IRISH TREATY.—The Irish Treaty was ratified by the British Parliament and signed by the King on March 31. Amendments inserted by the House of Lords were finally eliminated, and the treaty was ratified in its original form save for one clause. This, suggested by the government, provided that the period of one month during which Ulster was to consider entrance into the Free State should begin upon ratification of the Irish Constitution by the British Parliament.

UNITED STATES

AUSTRIAN LOAN EXTENDED.—*Special to The New York Times. Washington, March 15.*—The Senate by unanimous vote today passed the Lodge joint resolution for the release of America's lien upon Austria's state assets so as to enable the latter nation to raise a new foreign loan for the relief of women and children facing starvation in that portion of the former dual monarchy. Other creditor nations of Austria are ready to do likewise, but the delay on the part of the United States was holding up the whole plan for international relief for Austria and creating a most dangerous situation.

The resolution was:

The Austrian obligation held by the United States Grain Corporation for $24,055,708.92, principal amount, is dated September 4, 1920, bears interest at six per cent payable semi-annually, and is due January 1, 1925. —*New York Times,* 16 March, 1922.

RECOGNITION OF MEXICO NEARER.—It was stated in Washington on March 19 that letters exchanged between President Harding and President Obregon had reduced the question of recognition of Mexico to a matter of time. The chief difficulty was as to whether formal guarantees for the protection of American oil and mineral rights in Mexico should accompany or follow after formal recognition.